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Contrastive Linguistics

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"Subject-predicate relation  
but dialectical"

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RESEARCH AND TRAINING

# JOURNAL OF INDIAN E D U C A T I O N

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## CONTENTS

	1	EDITORIAL	
N. KRISHNASWAMY	3	Contrastive Linguistics	
E. DE SANSSURE (EXCERPT)	8	What is Language ?	
QASIR ZOHIA AHAM	10	The Preposition and the Undergraduate : A Linguistic Study	
S. PEE CORDER (EXCERPT)	17	The Meaning of Applied Linguistics	
PRASHA AHUJA	19	Role of Linguistics in Beginning Reading	
A. CHANDRASHEKHAR	24	Testing Achievement in Language Skills	
STANMOUR B. CHATMAN (EXCERPT)	28	Linguistics and Teaching Introductory Literature	
OM DIKSHIT	31	Retrollex Articulation in Sanskrit	
PETER STRIVENS (EXCERPT)	38	Linguistics and Language Teaching	
V. R. JAGANNATHAN	40	Language Study in India : A Survey	
ADARSH BALA	45	Milton's Misogyny	
KIRITI JOSHI	51	Research in Ashram	
	67	EDUCATIONAL NEWSPAPERS & JOURNALS	
	78	READERS' FORUM	
	80	BOOK REVIEWS	
	90	BOOKS AND PERIODICALS RECEIVED	
	91	ANNOTATED BIBLIOGRAPHY	

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*The JIE*  
*wishes its readers*  
*a happy and*  
*prosperous 1976*



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The *Journal of Indian Education* will have New Mathematics as its theme for the May 1976 issue. Articles on the following topics are invited from teachers, teacher educators and research workers:

- (a) Set Theory for Schools
- (b) Boolean Algebra. The Gateway to Computers
- (c) New Geometry: Its Salient Features
- (d) New Mathematics in Indian Schools. Problems and Perspectives

EDITOR

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# Editorial

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*"Subject-predicate relation is but dialectical"*

DIARMACIRJI (Circa A. D. 550)

WE OFFER to our readers a special number on "Linguistics for Schools". The purpose is to improve the linguistic content of the language teacher in order to make him effective in the classroom situation. To help the inquisitive readers we are providing an annotated bibliography this time. Other minor changes in the journal are intended to make it effectively communicative.

Time was when language teaching was considered the easiest of school jobs. In the underdeveloped countries, this concept obtains even today. In reality, however, language teaching is one of the most complex of occupations. Firstly, because the nature of language as such is not always easy to define. We know that language is not inherited but it is acquired or learnt. A child inherits merely a mechanism which would one day enable him to learn to use words in almost infinitely variable patterns. This mechanism consists of lips, tongue, palate, larynx, windpipe and nose, etc. besides the tiny cells (?) in the brain to encode and decode messages delivered either through visual symbols, signs or voices. Each operation of an individual part of the total inherited capacity of a human being has been subjected to study. In their complex forms they become significant to scholars and teachers.

Linguistics, to put it simply, is directly concerned with the understanding of language. As a corollary, this means that linguistics can and should help a teacher

teach a language well. For instance, if we know that words have been given arbitrarily then meaning (or else, same object would not have different words in different languages), we then naturally engage ourselves in learning their other nature. Various uses of words and their differing nature acquire meanings which can completely baffle us. For instance, as we come to learn that every language has three encoding systems, viz. semantic, grammatical and phonetical encoding, we immediately gather that each language has several morpheme shapes which are as yet unused. This, however, is a discovery that would help us learn a little more in our excitement.

In Europe and the United States of America, several institutes are devoting their time and resources to the study of linguistics so that the developed countries understand the mind of the underdeveloped ones through the study of their languages. But in countries like India, the purpose of studying linguistics is quite different. We have a number of languages and because of the three-language formula, 60 per cent of our actual time in the classroom is devoted to the study of one language or the other. Therefore, the job of the teacher becomes extremely difficult both in our synchronising time element and achieving the general objectives of education. In India, quite a few institutions are working in this field. We are giving a survey of the works Indian scholars have undertaken in the field of linguistics. This will be of particular use to the teacher as well as to the informed reader. [ ]

"Reason was incapable of action without a word-symbol, and the first moment of rationality must also have been the first beginning of interior language.. Man feels with his mind and speaks while he thinks; therefore, the development of language is as natural to man as his nature."

JOHANN GOTTFRIED HERDER  
*The Origin of Language*,  
1772

# Contrastive Linguistics

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N KRISHNASWAMY

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AS EVERYONE knows, the process of learning languages and the task of teaching languages are very complex. In spite of the earnest attempts of various scholars over the centuries, the understanding of the language learning-process still remains a mystery, the scholars have not yet succeeded in explaining the nature of language and how it is learnt, but the mind of a child somehow successfully internalises the facts of a language in the course of about five or six years and one often wonders how 'such a small head could carry all he knew'. Some scholars feel that languages are not taught but just caught by the learner and the teacher can only help the learner catch the language he is trying to learn; others believe that it may be possible to 'teach' a language

and that it is possible to work out a plan for teaching languages. Since the nature of language and the process of learning languages are still mysterious, the teacher of language often gropes in the dark. Either he leaves success to chance or tries to plan a strategy on the basis of his own experience and the experiences of other teachers. It is true that the assumptions in language-teaching methodology are largely an act of faith and that there is no such thing as *the method*, the teacher has to evolve his own method according to the demands of the situation in which he works. At the same time, the experiences of other teachers and what the scholars say may help us in our search for an efficient language-teaching methodology.

### *The Four Stages*

Broadly, there are four stages in teaching:

1. *Planning and preparation* of teaching materials on the basis of a good description of the language to be taught. The preparation of teaching materials implies the formulation of an appropriate syllabus;
2. *Presentation* or introducing the items in the classroom;
3. *Establishment* of the items taught;
4. *Cultivation* or the continued use of the items learned, in a variety of contexts in which their use is called for.

The presentation, establishment, and classroom cultivation are matters of technique; they form the art part of language teaching and a lot depends here on how resourceful the teacher is. But the planning part which includes the preparation of a good syllabus and the production of teaching and testing materials requires careful thinking.

### *The Gravitational Pull*

At the planning stage, it may be useful to remember that in learning the first language the learner struggles hard with only one linguistic system and that when he starts learning a second language, there is a 'clash' between the system of the first language and the system of the second. In other words, what the learner has succeeded in organising in terms of the first system must be reorganised in terms of the second system. The assumption is that when one language system becomes more or less a habit, the learning of a second language becomes rather difficult. The mistakes that are made in the second language are often due to the 'gravitational pull of the mother tongue'.

In spite of considerable exposure to

English, even the educated, for instance, in the South, use sentences like 'Your son college going *aa* ?', 'Your daughter getting married *aa* ?', etc. Obviously, one can see the pull of the mother tongue in such cases ; '*aa*' is a marker of questions in South Indian languages and there is no inversion in question formation as in English. So, instead of asking 'Is your daughter getting married ?', they ask 'Your daughter getting married *aa* ?'. All over India constructions like 'When you are going to do that ?' (instead of 'When are you going to do that ?'), 'He will come, isn't it ?' (instead of 'He will come, won't he ?'), 'We went out marketing' (instead of 'We went out shopping') are used because the patterns, processes and discriminations in Indian languages are different from those of English and the learners of English as a second language, naively and from force of habit tend to use the patterns of their mother tongue unless specifically taught to do otherwise. So, in order to avoid or minimise the pull of the mother tongue, it is better to compare the structure of the first language and that of the second language and grade the material on the basis of the similarities and dissimilarities between the two languages. The comparison of  $L_1$  (the first language) and  $L_2$  (the second language) is known as contrastive linguistics.

### *Nothing New*

The comparison of two linguistic systems is nothing new. Comparative philology is a well-established discipline and its popularity was at its height in the nineteenth century. But the aims and methodology of comparative philology are different from those of comparing languages for purposes of teaching. A philologist compares languages in order

to trace their linguistic relationships; he is interested in classifying languages into 'families' and finding out or reconstructing a parent language from which related languages have developed. A contrastive linguist, on the other hand, is interested in comparing linguistic systems as they exist today in order to find out the similarities and differences. The findings of the contrastive linguist may be useful in language teaching machine translation, and in the study of language universals.

Even in foreign or second language teaching the contrastive approach is not an entirely modern one. Terms like 'Anglicism', 'Germanism', etc. are indicative of the awareness of the pull of the first language. But the method of comparison was not systematic. With the growth of modern linguistics, contrastive linguistics has assumed the status of a separate branch of study. The credit for systematising this branch of linguistics should go to two American linguists, Robert Lado and Charles C Fries. Lado's book, *Linguistics Across Cultures*, published in 1957, marks the emergence of modern contrastive linguistics. But Lado and Fries have asserted that the most effective teaching materials are those that are based on a scientific description of the language to be learned, carefully compared with a parallel description of the mother tongue of the learner.

Two years after the publication of Lado's book, work on contrastive structure series was started by the Center for Applied Linguistics of the Modern Language Association of America in Washington. This series attempts a description of similarities and differences between English and each of the five foreign languages generally taught in the U. S. A.: French, German, Italian, Russian and Spanish. In India, the

Central Institute of English and Foreign Languages, Hyderabad, The Centre of Advanced Study in Linguistics at Annamalai University, Chidambaram, and the Central Institute of Indian Languages, Mysore, have done some significant work in this field.

### *The Technique*

The working technique evolved by Lado to carry out contrastive studies is shown on the next page

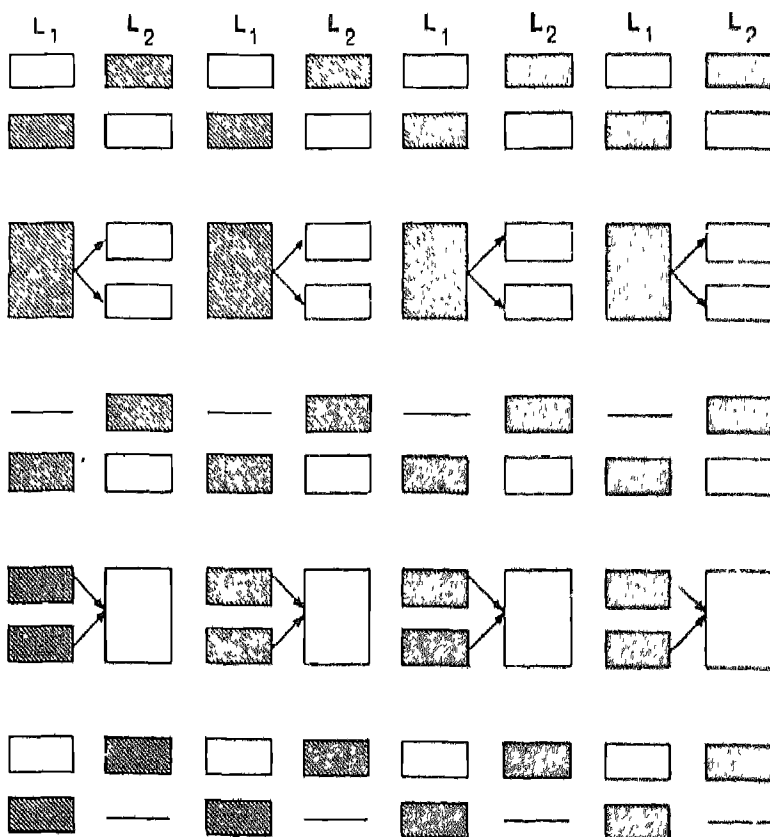
As a result of some new developments in linguistic theory, the recent contrastive studies have a transformational dimension and transformational rules in  $L_1$  which are compared with the transformational rules in  $L_2$ .

### *Limitations*

It must also be pointed out that the contrastive technique—whatever be the theoretical model—is only a predictive technique. This means that by looking at the structure of the second language one can only predict the difficulties the learner is likely to encounter; it does *not* mean that for all the mistakes that a learner makes in the second language, the first language habits alone are responsible.

Internal analogy, for instance, may be responsible for some of the mistakes. In learning English as a second language, one might say 'childrens', 'furnitures', 'teached', 'bringed', etc.; such mistakes are clearly due to internal analogy because the learner 'creates' these items on the basis of other items like 'boys', 'tables', 'walked', etc.

Pronunciation according to spelling, bad teaching, the non-standard variety used outside the classroom, the attitudes of those in power, the policy of the government, and other factors may be



### NOTES

1. The boxes represent the categories at the given level. The categories may be two or more, but, for the sake of presentation, only two are given in the table.

2. According to Lado, if there are similar categories in L1 and L2, there is no learning problem. Only the dissimilar categories will be problematic; instances of under-differentiation will be more problematic than instances of over-differentiation, because in over-differentiation the learner has just to suspend one category.

3. In most Indian languages, only one English word for 'snow', 'ice', etc. This can be cited as an example of under-differentiation at the lexical level in Indian languages. But Indian languages have a number of words for 'rice' and this may be cited as an example of over-differentiation at the lexical level.

responsible for bad learning. Also, the contrastive approach is *not* a teaching device. It provides an effective background to the preparation of teaching materials and it can only alert the teacher and those in charge of materials production

### *Why Not Experiment ?*

In the present context in India, there is a great need for contrastive studies. Contrastive studies can help us in machine translation and in a multilingual set-up

like ours there is need for special training in translation work. For these two specific purposes—effective second language teaching and translation work—it is better to encourage plenty of experimentation in our country so that the effectiveness of certain alternatives could be compared and tested. This becomes especially important when we find some suggestions being rejected without adequate discussion, or without awareness of all the problems involved, let alone experimentation. □

### *Let's Think It Over*

Useless grammar is a devastating plague. We who speak English have got rid of a good deal of the grammatic inflections that make Latin and its modern dialects so troublesome to learn. But we still say *I am, thou art, he is*, with the plurals *we are, you are, they are*, though our country-folk, before school teachers perverted their natural wisdom, said, *I be, thou be, he be, we be, you be, they be*.

This saved time in writing and was perfectly intelligible in speech. Chinese traders, negroes, and aboriginal Australians, who have to learn English as a foreign language, simplify it much further, and have thereby established what they call business English, or, as they pronounce it, Pidgin. The Chinese, accustomed to an uninflected monosyllabic language, do not say "I regret that I shall be unable to comply with your request." "*Sorry no can*" is quite as effective, and saves the time of both parties.

When certain negro slaves in America were oppressed by a lady planter who was very pious and very severe, their remonstrance, if expressed in grammatic English, would have been "If we are to be preached at let us not be flogged also; if we are to be flogged let us not be preached at also." This is correct and elegant but wretchedly feeble. It says in twenty-six words what can be better said in eleven. The negroes proved this by saying "If preachee preachee, if floggee floggee, but no preachee floggee too."

They saved fifteen words of useless grammar, and said what they had to say far more expressively. The economy in words, that is, in time, ink and paper, is enormous.

GEORGE BERNARD SHAW,  
Preface, *The Miraculous Birth of Language*,  
Prof. Richard Albert Wilson,  
1937, London

# What is Language ?

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EXCERPT FROM F. DE SANSURRE

THESE ARE the characteristics of language:

1. Language is a well defined object in the heterogeneous mass of speech facts. It can be localized in the limited segment of the speaking circuit where an auditory image becomes associated with a concept. It is the social side of speech, outside the individual who can never create nor modify it by himself, it exists only by virtue of a sort of contract signed by the members of a community. Moreover, the individual must always serve an apprenticeship in order to learn the functioning of language; a child assimilates it only gradually. It is such a distinct thing that man deprived of the use of speaking retains it provided that he understands the vocal signs that he hears.

2. Language, unlike speaking, is something that we can study separately. Although dead languages are no longer spoken we can easily assimilate their linguistic organisms. We can dispense with the other elements of speech, indeed, the science of language is possible only if the other elements are excluded.



3. Whereas speech is heterogeneous, language, as defined is homogeneous. It is a system of signs in which the only essential thing is the union of meanings and sound images and in which both parts of the sign are psychological.

4. Language is concrete, no less so than speaking; and this is a help in our study of it. Linguistic signs, though basically psychological, are not abstractions; associations, which bear the stamp of collective approval and which added together constitute language, are realities that have their seat in the brain. Besides, linguistic signs are tangible; it is possible to reduce them to conventional written symbols, whereas it would be impossible to provide detailed photographs of acts of speaking (*actes de parole*); the pronunciation of even the smallest word represents an infinite number of muscular movements that could be identified and put into graphic form only with great difficulty. In language, on the contrary, there is only the sound image, and the latter can be translated into a fixed visual image. For, if we disregard the vast number of movements necessary for the realization of sound images in the speaking, we see that each sound image is nothing more than the sum of a limited number of elements or *Phonemes* that can in turn be called up by a corresponding number of written symbols. The very possibility of putting the things that relate to language into graphic form allows dictionaries and grammars to represent it accurately, for language is a storehouse of sound images, and writing is the tangible form of those images. □

F. DE SANSSURE

*Reading for Applied Linguistics,*

(Eds ) J.P. B. Allen and S. Pit Corder,

Oxford University Press, London, 1973,

pp. 11-12

# The Preposition and the Undergraduate A 'Linguametric' Study

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THIS PAPER reports data with regard to the approximate number of the errors in the use of prepositions committed by the Intermediate (Science) students (of the age group 16-18) in writing essays. The data presented here indicate the exact nature of the deficiencies and difficulties of these students in this area. This study also brings to the fore how the students fare in the college with the passage of time since an attempt has been made to compare the errors in the answer books of the first and second terminal examinations of the same students.

The essays in 19 answer books of the first terminal examination, held soon after the students had joined college and

were fresh from schools, were taken up for a close scrutiny. The clear errors in the use of prepositions were marked, collected, and categorized. Then the essays in the answer books of the second terminal examination of the same examinees were subjected to minute analysis and the errors of preposition were, once again, underlined and placed under different heads. It should be noted that there was a gap of seven months between the two examinations. The experiment was conducted in the premier institution of a university. The examinees came mostly from middle class families. Some of them have passed out from the English medium schools. Three or four of them

belong to the scheduled tribes for whom English is not  $L_2$  but  $L_3$  or  $L_4$ —their multilingualism sometimes acts as a barrier in learning English. It is true that the types of errors the students of this college make are common to all colleges in this area. The first terminal examination was held when the students concerned were in the first year science class and the second took place when they were already second year science students. The average length of the essays was two foolscap size pages.

Indisputably, prepositions enable the users of English to express themselves accurately and are an important part of the English grammar. Many writers including G. H. Vallins<sup>1</sup> have warned against any false economy in respect of their use. We agree with Pittman when he says that though prepositions are easy to teach at elementary level, they are perhaps the most difficult to teach at advanced level.<sup>2</sup> This view in particular increases the significance of the present investigation.

The inquiry has revealed certain kinds of errors of preposition which deserve a close analysis. It is hoped that the results will be of interest to the teachers of English as a foreign language elsewhere too. Such analyses, in fact, enable the teachers to go to the level of the students themselves and to have a look at the students' difficulties from the students' own standpoints and thus to find out the areas where they need social help.

In the first terminal examination, the 19 essays contained 111 clear errors of preposition. Some seven months later things had only slightly improved since

the essays written by the same 19 students in the second terminal examination had 100 errors only. This by no means indicates a very satisfactory state of affairs and undoubtedly there is room for improvement. The comparatively short essays contained fewer errors but it is noteworthy that when the same students wrote longer essays in the second terminal examination they committed more errors. It would not be too much to say that some students become idle and just let things happen and, as a result, they deteriorate. A comparative study of the results in respect of the two terminal examinations gives interesting and meaningful conclusions. Out of nineteen students nine improved, seven deteriorated, and there was no change in three of them. This once again gives us food for thought. It is really a serious matter why seven students out of nineteen committed more errors later when they should have actually improved. The question that arises here is as to why the students are unable to learn.

It is found that in many cases prepositions were omitted. The omission of prepositions amounted to 28.80 per cent of errors in the first terminal examination and the number went down to 25 per cent in the second. It is evident thus that there is a general tendency among students to omit prepositions. Another notable tendency is to insert them where they are not required. This also accounts for a pretty large number of errors. The insertion of prepositions where they were not required caused 19.80 per cent errors in the first terminal examination. The position with regard to them was found slightly improved in the second terminal examination where they resulted in 19 per cent errors.

To be precise, 50.40 per cent errors

<sup>1</sup> G. H. Vallins, *Better English*, Andre Deutsch Ltd., 1955, p. 37

<sup>2</sup> G. A. Pittman, *Teaching Structural English*, Ginn & Co. Ltd., 1967, London, p. 10

in the first terminal examination were caused by (it can be guessed) confusion—one preposition used instead of the other. About 54 per cent errors were caused by confusion of this nature in the second terminal examination.

The inquiry reveals that as a general rule students do not use many prepositions: they use only a limited number of the more common among them. Here they have confined themselves to 14 prepositions ('To', 'In', 'With', 'At', 'By', 'For', 'Of', 'On', 'Upon', 'From', 'Till', 'Among', 'About' and 'After'). It is so largely because their vocabulary is comparatively small and they avoid big and complicated structures. For instance, they display an obvious predilection for writing sentences in simple present tense and try to avoid sentences in the past and future tenses because they find the latter comparatively difficult.

There are certain pairs of prepositions which are easily confused. 'At' and 'in' make one such pair. The confusion about them is quite common. In this study, 'in' used for 'at' caused 6.30 per cent errors in the first terminal examination and 7 per cent in the second, whereas 'at' used for 'in' resulted in 4.50 per cent errors in the first terminal examination and 4 per cent in the second.

'To' and 'in' have been found to be comparatively 'popular' with the examinees: these prepositions get the lion's share of errors. 'To' has been found to be particularly confusing. 'Is' is omitted where required in 9 per cent of the cases in the first terminal examination and 7 per cent in the second. The insertion of 'to' where it was not required resulted in 9.90 per cent errors in the first terminal examination and 10 per cent in the second.

In the first terminal examination, the

confusion in the proper use of 'to' amounted to 27.90 per cent errors and this confusion caused 24 per cent errors in the second. In fact, the use of prepositions is not found all that simple by those students whose L<sub>1</sub> is either Hindi or Urdu (most of the examinees studied here had Hindi as L<sub>1</sub>). For example, the Hindi or Urdu translation of the English sentence 'He went to London' will not have any equivalent to the preposition 'to'. Consequently, the errors with regard to 'to' predominate. The errors with regard to the use of 'in' were 23.40 per cent in the first terminal examination and 27 per cent in the second. 'At' gets the third position with 8.10 per cent and 12 per cent errors in the first and second terminal examinations respectively; 'for' is a close fourth. There is only one error each of 'upon' and 'after' in the first terminal examination and none in the second. It should not be supposed, however, that the students are quite familiar with the proper use of these prepositions. The fact is that they do not use them frequently enough and show a typical tendency, as emphasized earlier, to restrict themselves to common and simple prepositions (e.g., 'to' and 'in') while writing.

Frequently, the construction of the sentences made the task of locating and pinpointing the errors of preposition difficult (though such sentences were semantically incongruous or absurd). Thus most of the sentences cited as examples here have not been considered as having the errors of preposition for preparing the data.

It is learnt through this study that the students cannot use with felicity the structures involving phrases like 'in pulling' and 'in completing,' etc. They rather prefer to say "He spends his life

to pull the rickshaw" and "They are interested to see cinema" Sometimes, as one gathers, wrong constructions of the sentences make them place the preposition irregularly. Some typical sentences (from the examination answers) are given below.

- "There is no arrangement for teaching his children"
- "to earn money to fulfilment"
- "This amount is not satisfied to him"
- "He sleeps with hunger"
- "in the last time"
- "They check every student with clever"
- "In this season the sunlight is very effected to human being".

Occasionally, the idioms containing these prepositions are not used appropriately and thus confusion is caused.

- "They look at very beautiful"
- "They put on the chits from their pockets"
- "The people are dying shortage of food"
- "They do not look after him with respect".

At times peculiar situations are created because these prepositions are wrongly placed:

- "The programme is declared before two weeks"
- "I gave to answer every question"

- "Some students come in late examination hall".

It would be relevant to point out here that the syllabuses are not primarily language-oriented and the methods used to teach the poems and stories prescribed are generally not effective in respect of language teaching. The findings of this inquiry should make us examine our teaching materials and sincere attempts should be made to make them suitable and appropriate for the pupils concerned. It is good for the teachers to acquaint themselves with the kind of errors their students make. The pupils should be given sufficient practice in using the prepositions. It is advisable to give intensive drills in different structures where some confusion prevails. Since the errors reported in this study have been committed by college students who have, in theory at least, received instruction on all these items, re-teaching may prove effective. The teachers should bear in mind the pupils' particular deficiencies and requirements. Drill will definitely help a great deal in such cases. It is also necessary that the pupils should know what is wrong with the forms they have used. We hope that this will make them think and thus the learning of the correct forms will be facilitated. However, it must also be emphasized that the use of many of these prepositions can be mastered chiefly by mechanical associations.

## APPENDIX

TABLE 1

LIST OF ERRORS			
Sl. No.	Error	% error	
		First Terminal Examination	Second Terminal Examination
1.	'With' not required	0.90	—
2.	'With' for 'from'	0.90	1
3.	'With' omitted	0.90	—
4.	'With' for 'by'	—	3
5.	'With' for 'to'	—	1
6.	'In' omitted	4.51	7
7.	'In' for 'at'	6.31	7
8.	'In' not required	3.60	2
9.	'In' for 'for'	0.90	1
10.	'In' for 'between'	0.90	—
11.	'In' for 'on'	6.31	6
12.	'In' for 'to'	0.90	2
13.	'In' for 'with'	—	1
14.	'In' for 'of'	—	1
15.	'At' omitted	1.80	4
16.	'At' not required	0.90	1
17.	'At' for 'in'	4.51	4
18.	'At' for 'from'	0.90	—
19.	'At' for 'on'	—	3
20.	'To' for 'in'	3.60	1
21.	'To' omitted	9.01	7
22.	'To' not required	9.91	10
23.	'To' for 'by'	1.80	—
24.	'To' for 'with'	0.90	—
25.	'To' for 'for'	—	1
26.	'To' for 'of'	—	3
27.	'To' for 'from'	2.70	2
28.	'By' omitted	1.80	—
29.	'By' for 'with'	0.90	1
30.	'By' not required	0.90	—
31.	'By' for 'for'	0.90	—
32.	'By' for 'in'	—	1
33.	'For' not required	1.80	—
34.	'For' omitted	2.70	3
35.	'For' for 'to'	2.70	3
36.	'For' for 'of'	0.90	1
37.	'For' for 'on'	—	1
38.	'Of' not required	1.80	4
39.	'Of' omitted	0.90	3

40	'Of' for 'to'	0.90	2
41.	'Of' for 'from'	—	1
42	'Of' for 'in'	—	2
43.	'On' for 'for'	0.90	—
44.	'On' for 'of'	0.90	—
45.	'On' omitted	1.80	—
46.	'On' for 'by'	0.90	—
47	'On' for 'in'	2.70	4
48.	'On' for 'at'	0.90	—
49.	'Upon' for 'by'	0.90	—
50	'From' omitted	3.60	—
51.	'From' for 'to'	0.90	—
52	'From' for 'of'	—	3
53	'From' not required	—	2
54.	'Till' for 'for'	0.90	—
55.	'Among' omitted	1.80	1
56.	'About' for 'for'	1.80	—
57.	'After' for 'for'	0.90	—
58	'Is' for 'in'	2.70	—

TABLE 2  
NUMBER OF ERRORS—COMPARISON

Specimen No.	Number of Errors		Remarks
	First Terminal Examination	Second Terminal Examination	
1.	4	4	No change
2.	2	8	Deteriorated
3.	8	8	No change
4.	2	1	Improved
5.	11	15	Deteriorated
6.	5	11	Deteriorated
7.	7	1	Improved
8.	7	2	Improved
9.	10	7	Improved
10.	5	8	Deteriorated
11.	3	4	Deteriorated
12.	2	1	Improved
13.	10	7	Improved
14.	2	3	Deteriorated
15.	5	3	Improved
16.	16	6	Improved
17.	7	4	Improved
18.	4	6	Deteriorated
19.	1	1	No change
Total	111	100	

TABLE 3  
PREPOSITIONS OMITTED

<i>Preposition</i>	<i>First Terminal Examination</i>	<i>Second Terminal Examination</i>
'With'	.90	
'In'	4.50	7
'At'	1.80	4
'To'	9.00	7
'By'	1.80	
'For'	2.70	3
'Of'	.90	3
'On'	1.80	
'From'	3.60	
'Among'	1.80	1
Total	28.80	25

TABLE 4  
PREPOSITIONS INSERTED WHERE NOT REQUIRED

<i>Preposition</i>	<i>First Terminal Examination</i>	<i>Second Terminal Examination</i>
'With'	.90	
'In'	3.60	2
'At'	.90	1
'To'	9.90	10
'By'	.90	
'For'	1.80	
'Of'	1.80	4
'From'		2
Total	19.80	19



# The Meaning of Applied Linguistics

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EXCERPT FROM S. PIT CORDER

THE APPLIED linguist is a contributor to the whole language-teaching operation. He does not control it, nor does the classroom teacher, nor, for that matter, does the headmaster or the Minister of Education. It is a cooperative venture. The better each contributor's understanding of the principles upon which decisions are made at all levels, the better chances the whole operation has of being successful. But we must expect that all along the line compromises will have to be made. For example, psycholinguistic knowledge might suggest that there is some optimum age for beginning the study of foreign languages. Political and economic considerations might indicate that it was undesirable on a cost-benefit analysis to devote the necessary funds to providing qualified teachers at that level. The two principles would be in conflict. The final plan would represent a compromise. All the contributors to a total teaching operation are involved in its success: society, as represented by the education authorities, the applied linguist

and the classroom teacher. But, as in all educational operations, the difficulty is to define what is meant by success. Society might define it in terms of social integration, commercial pay-off, or some concept of the 'educated man'; the teacher might define it in terms of academic achievement, or the 'fulfilment of the individual'; *the applied linguist in terms of the attainment of some measurable performance skills in the language*. But it is individuals who learn language and they do so for many different reasons: because they enjoy it, because it is useful in their academic achievement or in their future careers, or because it opens for them opportunities for social and cultural contact and enrichment. They do not all necessarily seek, or need, the same level of performance ability or even the same set of linguistic skills. What is success for one may be failure for another. The individual learner is very much concerned with success in his own terms.

For any measurement of success one needs a yardstick or a measuring instrument. No one has proposed as yet a means of measuring success in language learning in society's terms—cultural, social or commercial. But to the extent that the teacher's and the applied linguist's aims can be specified in linguistic terms as the attainment of specific skills and knowledge, a way of measuring these can be devised. What we can describe we can, in general, measure. *Linguistics gives us a framework for describing what we mean by skill in, and knowledge of, a language and consequently makes it possible in principle to show that one way of teaching or one set of teaching materials is more effective than another for achieving a particular aim with a particular group of learners.* There can be no systematic improvement in language teaching without reference to the knowledge about language which linguistics gives us.



S. PIT CORDER  
*Introducing Applied Linguistics*  
 Penguin Education, 1973

# Role of Linguistics in Beginning Reading

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WE ARE witnessing an era of all-round advance in every field. Science and technology have taken us to the moon and are dreaming to build a beautiful world in the sky. Educational innovations are also trying to keep pace with the progress in other fields. In this age of communication revolution and educational changes, language teaching revolution is affecting the every day lives of millions of people who are either pupils or teachers of languages.

When we talk of language teaching revolution we should not forget the role of reading which is the very axis of education in general, and language teaching in particular. Indeed, in certain respects, the teaching of reading occupies a more important place in today's educa-

tional programme than in the past.

As teachers, we have been trained in the application of psychological principles to classroom procedures. We might be said to be amateur psychologists. Certainly, we have had a great deal of help from psychologists in the teaching of reading. But most of us have had little training in the linguistic concepts which now clamour for recognition. We have been flying on one wing. Somehow, now in mid-air, we must assemble that other wing of appropriate size and shape and timing to provide balance and efficient progress in flight.<sup>1</sup>

Linguistic methods of teaching read-

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<sup>1</sup>Constance M. McCullough, "Linguistics, Psychology and the Teaching of Reading," *Elementary English*, April 1967, pp. 353-62

ing place much emphasis on beginning with the alphabet Bloomfield writes:

The first step, which may be divorced from all subsequent ones, is the recognition of the letters. We say that a child 'recognizes' a letter when he can, upon request, make some response to it...The conventional responses to the sight of the letters are then names, 'aye, bee, see,\*dee, ce, eff,' and so on... There is not the slightest reason for using any other responses.

He continues:

The child should be familiar with all the letters, capital and small, of the printed alphabet before reading is begun. Not all of them will be used in the first reading work but we do not want the reading work, at any stage, to be upset by the appearance of unfamiliar shapes<sup>2</sup>

Fries is also adamant regarding the importance of learning the letters of the alphabet, although he restricts the shapes children should learn to write capital letters. Unlike Bloomfield, Fries does not advocate learning the names of the letters:

To learn the "letters" often means pronouncing the names in order to "spell" words. This again contri-

butes little in the beginning stage of reading.

But learning the letters may mean learning to identify and distinguish the graphic shapes that represent the written word patterns. This ability to identify and distinguish the graphic shapes does not necessarily mean attaching the conventional names to these distinctive shapes, although the names are very useful as one means of checking the identification response. It is, however, essential to reading at the very beginning that pupils have already developed such an ability to identify and distinguish the graphic shapes of the letters as can be shown by instant and automatic responses of recognition.<sup>3</sup>

In other words, it is essential that children recognise significant difference in the shapes of letters; if they also learn to attach letter-names to these shapes, this is an added advantage

Lefevre places somewhat less emphasis on learning the alphabet. He suggests that this will be a natural outgrowth of interest in language on the part of the child.

In connection with reading readiness, it is interesting that some pre-school children undoubtedly learn to read by their own spelling method. Not so lucky as children who have listened to enchanting books read aloud to them by fond adults, such children nevertheless learn for themselves that words are graphic representations of things they can see and hear. They study the labels on boxes

\*What happens when the child is exposed to "c" as it sounds in "cat", "coal", "close", or "g" as in "go", "girl"? "Calling" letters of the alphabet creates a number of problems as well as solving some

<sup>2</sup>Leonard Bloomfield and Clarence Barnhart, *Let's Read: A Linguistic Approach*, Wayne State University Press, Detroit, 1961, p 35

<sup>3</sup>Charles C. Fries, *Linguistics and Reading*, Holt, Rinehart and Winston, Inc., Publishers, New York, 1963, p. 124

of soap or breakfast cereal, signs along the street, billboards, newspaper and magazine titles, television captions and advertising, anything and everything in print. They ask to hear what words these graphic symbols say. They ask how to spell the words. What are the letters, from left to right? How do you say the names of the letters? They say the words and the names of the letters aloud. They copy them. It is not much of a step for these children to ask how to reverse the process and write what they say. At this point they do not need to be able to "sing" the alphabet as an arbitrary sequence of letters. They do know the alphabetic principle through knowing the names of many letters and some of the sounds the letters may represent.<sup>4</sup>

The proponents of the phonological approach to beginning reading instruction are unequivocal in their rejection of the thesis that "beginning reading instruction should be a meaning-making process." In the words of Barnhart, co-author of *Let's Read*. "We find Bloomfield's system of teaching reading is a linguistic system. Essentially a linguistic system of teaching reading separates the problem of the study of word form from the study of word meaning."<sup>5</sup> Bloomfield concurs:

Aside from their silliness, the stories in a child's first reader are of little use because the child is too busy with the mechanics of reading to get anything of the content...This does not

mean that we must forego the use of sentences and connected stories, but it does mean that these are not essential to the first steps. We need not fear to use disconnected words and even senseless syllables, and above all we must not, for the sake of story, upset the child's scarcely formed habits by presenting him with irregularities of spelling for which he is not prepared.<sup>6</sup>

Fries states: "Seeking an extraneous interest in a story as story, during the earliest steps of the transfer stage is more likely to hinder than to help the efforts put forth by the pupil himself."<sup>7</sup> John Dawkins, a non-linguist, who supports the methodology under discussion writes: "Reading, thus, is the act of producing correct sounds from symbols. If the reader does not know the meaning of a word he can still 'read' it if he knows the alphabetical system. The reader of English can read 'gan' and 'foggie' and many other nonsense and real words because he knows the alphabetical system."<sup>8</sup>

That Fries is bothered by the issue of meaning is evidenced in a later writing where he states: "As a matter of fact the primary objective of our materials built upon linguistic understanding is the ability to read for meanings." The better part of a page is devoted to an explanation of the cumulative meanings the child must grasp in reading the material: Nat is a cat. Nat is fat. Nat is a fat cat.<sup>9</sup>

<sup>4</sup>*Ibid.*, p. 34

<sup>7</sup>Charles C. Fries, *Ibid.*, p. 199

<sup>8</sup>John Dawkins, "Reading Theory—An Important Distinction", *Elementary English*, 38, October 1961, pp. 389-392

<sup>9</sup>Charles C. Fries, "Linguistics and Reading Problems at the Junior High School Level", *Reading and Inquiry*, International Reading Association Proceedings, 10(1965), pp. 244-247

<sup>4</sup>Carl A. Lefevie, *Linguistics and the Teaching of Reading*, McGraw-Hill Book Company, New York, 1964, p. 38

<sup>5</sup>Leonard, Bloomfield and Clarence L. Barnhart, *Ibid.*, p. 9

Linguists are in general agreement that the child should be able to recognize the letters of the alphabet and to associate a sound with each letter before he starts reading. Bloomfield is the only one who insists that children name each letter aye, bee, see, etc. In many of our schools, teachers follow this very approach for teaching reading to the young ones. However, in some of the schools, children learn the alphabet in a more incidental manner, and knowledge of the alphabet in a sequenced form is not considered crucial to success in beginning reading.

Bloomfield is of the opinion that pictures should not be given in the books meant for teaching beginning reading as they distract the attention of the child. Bloomfield includes no pictures at all, and the last pages of the final story in the Harper and Row pre-primers are without illustrations.

Helen Robinson, writing in the teachers' edition of *More Roads to Follow* presents a contrasting point of view. She is, in fact, very clear in stating her concept of the role of context clues in general and picture clues in particular—context clues are perhaps the most important single aid to word perception. Whether a youngster identifies a printed word quickly or whether he stops to analyse it, he must be sure it makes sense in the sentence. The use of context clues is based on two understandings of language. (i) a word may have more than one meaning (and pronunciation) and (ii) the meaning (and sometimes the pronunciation) depends on the context.

At early levels, the child relies upon pictures and sentence context for meaning clues. For example, if a picture of a horse accompanies the text in which the word 'horse' is used, he is not likely to

think that the word is 'house'.<sup>10</sup>

Many linguists would probably like to comment that knowledge of patterns, leading the child to recognise 'horse' and 'house' without the aid of picture clues, would lead to independence in reading somewhat sooner. A psychologist or an educationist, on the other hand, would prefer to make use of pictures in children's books to serve not only as context clues but as a motivational source to attract the children and thus making reading a pleasurable activity for the young ones. A linguist is of the opinion that motivation comes through the child's knowledge of the progress he is making. However, this difference of opinion goes on and it is, in fact, a healthy sign of progress. In the meantime an elementary school teacher who introduces beginning reading for the young children should keep some basic linguistic principles in mind such as: (a) language is speech; (b) common spelling patterns form a useful basis for a beginning reading vocabulary; and (c) if pitch, stress, and pause or juncture are important in conveying meaning in speech, they are important in oral reading.

Since teaching reading to the beginners is a delicate task, involving plenty of labour on the part of an elementary school teacher, the teacher needs to broaden his over-all understanding of the language he teaches.

Heilman remarks :

Recently there has been an awakening of interest in the question of how linguistic findings might aid the school in developing more meaningful edu-

<sup>10</sup> Helen M. Robinson, "A Firm Foundation for Middle Grades Guidebook", *More Roads to Follow*, Scott, Foresman & Co., Chicago, 1964, p. 215

cational experiences. Some linguists have turned their attention to the teaching of the reading process. It has been difficult for these linguists to apply the same scientific rigor to reading instruction that they apply to study the language.<sup>11</sup>

Unfortunately, only a few linguists have tried to explain their work so that the typical classroom teacher could understand it and make changes and adaptations in terms of the new knowledge. It is the well-known problem of the "thinkers" being separated from the "doers", the theorists vs. the practitioners.<sup>12</sup>

The linguists have uncovered a mass of data regarding the operation and structure of language. They have devoted years to studying the changes which have occurred, to analyzing languages and developing superior methods and techniques for making such analyses. It is probably clear that no modern elementary teacher of the language arts would intentionally disregard such a significant body of knowledge.<sup>13</sup>

The linguists have evolved theories relative to instructional materials and methodology, but these have not been tested longitudinally in the classroom. There is little research data upon which to base conclusions. Linguistic science has not been concerned with the issue of 'how children learn to read', and some linguists have started with an assumption

of how they 'should' learn this process. This factor, ignoring the learner, may inhibit the efficacy of some suggestions advanced by linguists.<sup>14</sup>

It is important to recall that linguists are primarily concerned with the scientific study of language, its history, and/or its present structure. Therefore, they view the reading process from a somewhat different point of view than do those whose advice has been so carefully heeded in the past—psychologists, reading clinicians, and classroom teachers of superior ability. The linguists are not professional educators and few of them have struggled with the typical classroom teacher's problems in teaching large groups of children to read. Recalling the remark that education is too important to be left entirely to professional educators, linguists' proposals for teaching reading deserve to be examined, objectively and carefully. Selected aspects of their programmes may well be incorporated into elementary school curricula or, in the light of research relating to the success of these programmes, our present techniques may be radically altered and a linguistic programme adopted.<sup>15</sup>

There are many more things which we still need to explore as far as our knowledge of language is concerned. If the language teacher informs himself of the latest findings in the fields of psychology and linguistics and tries to find out the possibilities of their appropriate application, there is no doubt that a superior programme in teaching of beginning reading will emerge. □

<sup>11</sup> Arthur W. Heilman, *Teaching Reading*, Charles E. Merrill Publishing Company, 1967, Columbus, Ohio, pp. 251-252

<sup>12</sup> Pose Lamb, *Linguistics in Proper Perspective*, Charles E. Merrill Publishing Company, Columbus, Ohio, 1967, p. 2

<sup>13</sup> *Ibid.*, p. 18

<sup>14</sup> Heilman, *Ibid.*, p. 252

<sup>15</sup> Pose Lamb, *Ibid.*, p. 28

# Testing Achievement in Language Skills

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ALTHOUGH the process of testing achievement in language skills is as old as the process of formal teaching, attempts at the systematization of tests based on scientific principles have perhaps been made only in the last quarter of a century or so. The active participation of linguists in the business of language teaching during the Second World War and the consequent interaction between linguistics, pedagogy and psychology ushered in a new era not only in language teaching but also in testing which started yielding positive results in the early fifties. Both the teaching and testing were based on the language competence which composed of four skills; understanding, speaking, reading and writing.

The new trend in testing was set when

language teachers began to ask themselves questions like: What precisely is being tested? Are the students being tested on what they have actually been taught? What is the test expected to achieve? By using these techniques am I actually finding out what the student knows? Reflecting along these lines it was found that many conventional tests were "inappropriate, mysterious, unreal, subjective, and unstructured."<sup>1</sup>

Language tests in the past consisted mostly of questions on the grammatical structure of the language together with correction and translation exercises. No thought was given to the purpose of the

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<sup>1</sup>P. D. Stevens, *Papers in Language and Language Teaching*, Oxford University Press, London, 1965



test. The result was that the outcome of the test had practically no impact on the teaching programme. And the students looked upon the test as nothing but an evil, as something to be dreaded and, if possible, avoided.

The new approach to language teaching mentioned above, however, necessitated the construction of different tests for the different purposes which were identified as the concern of the foreign language teacher. The major ones among these are: prognostic tests, proficiency tests, achievement tests and diagnostic tests. We will be mainly concerned with achievement tests in this article.

The basic principles of a good test is that it should be conceived as a teaching device. Its primary purpose is to act as a guide both to the teacher and to the student. It is a guide to the teacher in the sense that it shows him at what points his teaching has not been effective, points which are particularly difficult for the students and where they need more careful and intensive teaching. The results of a test, in other words, help the thoughtful teacher to modify his method of presentation of a particular aspect of the language to facilitate adequate and more effective learning. So far as the student is concerned, the test should indicate to him where he has mastered the material and where he has to give special attention in order to gain mastery.<sup>2</sup>

Unless the objectives of the teaching either in the classroom or in the language laboratory are quite clearly formulated, it is not possible to construct proper tests. For, the fundamental requirement of a good test is validity, which requires a clear notion of the skill that is involved

in the test. A test which tends to mix up the four language-skills is bound to prove useless as a step in the educational process.

Take, for example, a dictation test. At least three different skills are involved here. The student has to have the ability to understand the spoken language; he must be able to read it; and he must be able to write it. Also, the student must be able to retain what he has heard long enough to write it down in full. Now, if the dictation test is given as a test of the skill of understanding alone, it cannot be considered as a valid one. The student who is good at comprehension but poor in writing and reading or poor in auditory memory may not perform as well as one whose comprehension is not good enough but who has learnt writing and has a strong auditory memory. Similarly, if one seeks to test reading comprehension by means of a translation exercise one would inadvertently be mixing up various things such as the ability to express one's thoughts in the language into which the translation is being made, the understanding of culture, and the points at which the two languages concerned are similar or different. Thus, it is clear that in these tests, it is not easy to separate the skills involved and to assess each properly.

The ideal foreign language achievement test, thus, should test only one thing at a time. If the teacher wants to test the student's ability to speak the foreign language, the latter should be placed in a communication situation and his behaviour carefully observed.<sup>3</sup> This can be done in one of the following two ways: the examiner may conduct an oral inter-

<sup>2</sup>A. Chandrasekhar, *A New Approach to Language Teaching*, Linguistic Circle of Delhi, 1965

<sup>3</sup>Wilga Rivers, *Teaching Foreign Language Skills*, The University of Chicago Press, Chicago, 1968 (third impression, 1970)

view in the traditional manner or two students may be asked to make up a conversation about a definite topic for which the appropriate stimuli are provided in the environment. In the former case, there are more chances of the student becoming tense and nervous, with the result that he may not be able to give a good account of himself in spite of possessing the necessary competence, whereas the chances of his feeling at ease are greater when he is speaking to a fellow-student. In either case, however, the conversation has to be properly controlled and guided, and the assessment should concentrate on correct pronunciation and the use of natural and idiomatic sentences.

Another important principle of a valid foreign language test is that the student should be tested only on what he has been taught. The traditional grammar questions and translation exercises demand a great deal of knowledge about the language. It is more a question of testing the memory of the student for the items he has been taught than finding out how much of the language he actually knows. The new approach to language teaching, however, concerns itself with the four language skills, that is to say, with the production of a practical knowledge of the language. The traditional type of test will not, therefore, be a valid measure of achievement in the case of one who has been taught in the new way. Special tests have thus to be devised for testing the achievement in the different language skills.

There is also need to make a distinction between class tests and terminal tests even when measuring achievement is the objective of a test. The class test is, in fact, an aid to teaching. The teacher has to know how much of what he has taught has been absorbed by the students,

and at what points the students are experiencing difficulty. It serves more the purpose of a diagnostic test on the basis of which remedial teaching may be provided. The sole purpose of a terminal test, on the other hand, is to grade students for promotions to the next higher level of instruction or for awarding the certificates of proficiency. A careful analysis of the errors in the student's answers as well as his correct responses will provide the teacher with the necessary information for making his teaching more effective.

As has been stated above, the achievement in the four language skills should be measured separately as far as possible. No doubt, there is bound to be some overlapping, but the examiner can always concentrate on one skill at a time and devise definite criteria for measuring it. We will now take a quick look at the possible techniques that may be employed for measuring achievement in the four skills.

Comprehension may be tested both with the oral and written materials. At the lower levels of instruction, it may be appropriate to employ the oral technique. This may take the form of either a conversation using, of course, only the materials which have been taught, or by employing different types of objective tests such as fill-in-the-blanks, true-false items, multiple-choice items, etc. At the higher levels the technique of translation may be used with advantage, provided one keeps in mind the pitfalls involved in assessing a translation exercise (briefly given above). Asking questions on a given foreign language passage as well as the precis exercise are other useful methods of testing comprehension.

The speaking skill needs to be measured carefully in all effective language teaching

programmes. The neglect of this area is indeed the greatest defect of the current practices of language teaching in India. It is a tragedy that most of the students learning English in our country are given little or no experience of speaking the language with some kind of international acceptability. By giving this aspect of language learning its due importance, it is possible not only to achieve more worthwhile results in the acquisition of the language but also to make the learning of the arts of reading and writing easier.

The testing of the reading skill has much in common with the testing of comprehension. The differences are, as Lado puts it, "the less controlled speed, the by-passing of pronunciation problems, the greater complexity and length of the structures and utterances, and the wider range of vocabulary."<sup>4</sup> In a sense, the test of reading ability is a higher level test of comprehension, although the advantage the student has of going back and forth in the reading process by re-reading the material cancels out some of the aspects of its higher importance. One important factor which should be taken note of while constructing the tests for reading comprehension is that it is only linguistic meanings which should be the object of test and not individual meanings. Linguistic meanings are meant to include the connotations conveyed by the language to the speakers of it as opposed to meanings that are perceived only by those who have specific background information not known by the other speakers in general."<sup>5</sup> Depending on the level of the student's achievement, different aspects ranging from specific items of information to literary appreciation could

be the objective of a reading comprehension test.

The testing of writing skill is perhaps the easiest from the point of view of test construction. From the construction of grammatical sentences and the correction of errors to the production of essays with literary qualities, there are many types of tests of this skill. But at the higher level, it is not possible to have objective tests which would make the task of assessing easy. By and large, these tests are of the traditional type, although here again the modern approach would have the objectives of the test more clearly defined than in the traditional practices.

How to avoid the "mysterious, unreal, subjective and unstructured" aspects of a test? Any good test, no doubt, should be free from these defects. The basic requirement is that the students should know what they are expected to know in any course. And the teaching should be based on this knowledge. It is extremely important in this regard to spell out the material to be learnt in great detail. The steps in the learning process should also be carefully specified in a logical order. The syllabus, in other words, should be elaborately and algorithmically prepared. If this is done, the tasks of both the teacher and the student would be made easy. A test which is based on such a syllabus cannot commit the sin of seeking to test what the student does not know. Tests would no longer be "regarded as outside teaching, as the antithesis of teaching."<sup>6</sup> The use of programmed material and teaching machines would automatically ensure that tests become an integral part of teaching and that students are tested precisely on what they have been taught. □

<sup>4</sup>Robert Lado, *Language Testing*, Longmans, London, 1961 (third impression, 1964)

<sup>5</sup>*Op. cit.*, p. 228

<sup>6</sup>W. A. Bennett, *Aspects of Language and Language Teaching*, The University Press, Cambridge, 1968

# Linguistics and Teaching Introductory Literature

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EXCERPT FROM SLYMOUR B. CHATMAN

THE CENTRAL problem in the teaching of literature is to bridge the gap to show students how to expand and refine their disturbingly narrow grasp of potential structures, to develop a whole new syntactic and lexical musculature, for dealing with the complexities of Milton, Shakespeare, and Pope. One way to accomplish this is to treat the text almost as if it were a foreign language (for it is at least a foreign dialect), to be parsed and worked over until pattern and meaning are learned and overlearned. All the devices that linguistics has developed for teaching foreign languages might be tried: substitution within a frame, imitative oral drill (with particular attention to stress, pitch, and juncture), restructuring for analysis, expansion, and omission, etc. Furthermore, the instructor must be aware at every moment of the specific linguistic

complexities of the piece he is teaching in relation to the level of his class. This is as important to his immediate job as a knowledge of mythic patterns in the modern English novel or what nasty fellows Elizabethan printers were. He must attempt—and it is a painful job—to uncover the multifoliate layers of his own literary sophistication and put himself in the students' position. He must realize that students are unable to move with the linguistic facility that he has developed in himself, that they are not alert to the lexical and structural possibilities of language and are quickly reduced to helplessness if the first meaning which comes to mind proves untenable. Nor are they willing to pore over a passage until it makes sense, because they know that more than poring will be needed to help them.

Let us consider the three areas where linguistics might be helpful. I. *Lexicon*. We must be careful not to shrug our shoulders over the lexical problem and say, 'It's all in the dictionary.' First of all, the facts of American college life are such that we cannot count on a student to buy a decent dictionary, let alone use one. This bit of student pathology, of course, is not our problem. What is disturbing is that even where a student shows a willingness to use the dictionary, it is all too clear that he often doesn't know when. Most students dutifully look up words that they don't 'know', that is, words that they've never seen before. But it is not the unusual word that causes the trouble. Even lazy students can be expected to look up 'incarnadine' and 'multitudinous' if threatened with quizzes. The real danger lies with relatively simple words that are known in one—but the wrong-definition. Not only doesn't the student understand the word, but far worse, he doesn't even know that he doesn't understand it. And the astonishment and disbelief in his eyes when you tell him that words often have more than one meaning! Here are a few rather obvious instances that have troubled my students:

*I only hear*  
*Its melancholy, long, withdrawn roar.*  
*Retreating to the breath*  
*Of the night wind, down the vast edges dear*  
*And naked shingles of the world.* (small beach stones)

*From this descent*  
*Celestial virtues rising will appear*  
*More glorious than from no fall.* (angelic host)



# Retroflex Articulation in Sanskrit

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OM DIKSHIT

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## I

THE RETROFLEX articulation in Sanskrit has excited the interest or curiosity of scholars and linguists ever since Sanskrit became known in the West. The retroflex sounds are articulated "with the under side of the apex placed against the alveolar region and therefore they are called retroflex. The retroflex quality of these sounds results either from the inversion of the tongue or from the retraction of the tongue-tip."<sup>1</sup> The retroflex sounds have been often described as cerebral, domal or cacuminal<sup>2</sup> because

they are pronounced with the tip of tongue turned backward and upward against, in some cases, the hard palate. In most of the Indian languages, including Sanskrit, the retroflexes are pronounced in the alveolar or post-alveolar domain.<sup>3</sup>

The retroflex sounds are strange or foreign to the Indo-European family. They occur as phonemes only in historical members of the Indo-Aryan sub-family and its parent Sanskrit. Now, in Sanskrit, they appear to be fullfledged, bonafide members of the phonological system, integral and operative in its

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<sup>1</sup>R.P. Dixit, *The Segmental Phonemes of Contemporary Hindi*, University of Texas, Unpublished M.A. Thesis, 1963, p.75

<sup>2</sup>J. R. Firth, "Alphabet and Phonology in India and Burma", *BSOS*, VIII, 1936, pp. 517-46

<sup>3</sup>O. Svamy and Kamil Zvelebil, "Some Remarks on Articulation of the 'cerebral' Consonants in Indian Languages, Especially in Tamil", *Archiv Orientalni*, XXIII, 1955, pp. 374-434

grammatical treatments. The Dravidian and Munda languages are considered by many linguists and phonologists as the sources of retroflexion in the Indo-Aryan languages. The fact that retroflexes show abundantly in the Dravidian and Munda languages, with which Indo-Aryan dialects have had contact over many hundreds of years, points to substratic influence, exercised on the Aryan group by the Dravidian and Munda groups through borrowing. The Sanskrit retroflexes pose two broad questions for historical and comparative linguistics:

1. How does the phenomenon in Sanskrit relate to the phonology of other Indo-European languages?
2. What, if anything, does it owe to retroflexion in the non-Aryan languages of the Indian sub-continent?

This paper tries to present some answers to these questions, advanced by several investigators into various aspects of these problems. Usual explanations have recourse to evidence of foreign or extraneous influence, or for more or less natural evolution or mutation of inherited sounds. While some investigators may credit one more than the other, most of them recognise that these represent two of perhaps several diverse strands which are interwoven to form the coherent subset of retroflex phonemes within Sanskrit phonology.

The retroflex series occurs in the earliest Sanskrit texts.<sup>4</sup> Thanks to observations of the writers on Indian languages especially Allen<sup>5</sup>, there is little doubt

about their phonetic value or phonemic status; although Allen complains that the writing system, being phonemic for the sake of orthographising simplicity, has probably obscured crucial and irretrievable phonetic information.<sup>6</sup> Whitney's tabulation of Sanskrit sounds shows the incidence of the retroflexes to be comparatively small in a representative sampling of Sanskrit texts<sup>7</sup>; Allen notes that the proportion of retroflex stops, especially, is lowest in the Vedic<sup>8</sup>. However, in later stages, the incidence of all retroflexes increases steadily; in particular, the stops occur with increasing frequency, while the retroflex continuants decline. The attested rise in the ratio is, of course, highly relevant to concepts of the developing Indian *sprachbund*.

The several members of the retroflex series behave in interconnected yet quite divergent and intricate ways, which both reflect developments from earlier Indo-Aryan clusters, and operate morphophonemically within grammatical processes. The stops and *ṇ*, for instance, generally result "passively" from inherited or morphological clusters, triggered by the presence of an *s* or an *r*. While *ṣ* itself generally derives from an *s* with appropriate conditioning environments. Details of more or less regular *sandhi*-retroflexion processes as well as vexing anomalous ones are spelled out in *Sanskrit Grammar*<sup>9</sup>,

<sup>4</sup>W.S. Allen, "Some Prosodic Aspects of Retroflexion and Aspiration in Sanskrit", *BSOAS*, XIII, 4, 1951, pp. 939-946

<sup>7</sup>W.D. Whitney, *Sanskrit Grammar*, 2nd Edition, London, 1964, para 75

<sup>8</sup>W.S. Allen, "Retroflexion in Sanskrit. Prosodic Technique and its Relevance to Comparative Statement", *BSOAS*, XVI, 1954 pp. 556-565

<sup>9</sup>W.D. Whitney, paras 45-6, 61-2, 180-87, 189-99, 218, 221, and 225-6

<sup>4</sup>M.B. Emeneau, "India as a Linguistic Area", *Language*, 32(1) 1956, pp. 5-6

<sup>5</sup>W.S. Allen, *Phonetics in Ancient India*, Oxford University Press, 1953



*The Sanskrit Language*<sup>10</sup>, and *Sanskrit Sandhi and Exercises*.<sup>11</sup> Edgerton<sup>12</sup> gives a thumbnail sketch of retroflex phenomena, both internal and external, to *sandhi*.

Other investigators, probing beyond the mere facts of *Sandhi*, discuss retroflexion in terms of something like phonetic stages or mutation in Indo-European through Indo-Aryan. Considering the relevance of *s* to retroflexion phenomenon, this writer considered or consulted a number of them who attempted to chart the relation of *s* in Indo-Aryan to parallel phenomena in earlier stages and in sister languages as well as the alternation of *s* and *r*. Maish<sup>13</sup> examining the background of *sandhi* phenomena involving *s*, gives the sources of \**z*, notes their behaviour before stops and in *pausa*, their alternation with *r*; and their role in retroflexing the following stops. A similar analysis is undertaken by Martinet<sup>14</sup> whose treatment is even more "phonetic mutation" oriented than that of Marsh. Adducing articulatory principles, Martinet tries to show that through the influence of a juxtaposed close vowel *i* or *u*, a dorsal stop, or "high *r*" what he posits as a "high variant" could develop.<sup>15</sup> In support of this he notes similar effect in Iranian and in Balto-Slavic which, he cautions, are parallel, not common developments.

<sup>10</sup>T. Burrow, *The Sanskrit Language*, 2nd Edition, London, 1965, pp. 96, 79-80, 90-2, 93-5

<sup>11</sup>M.B. Emeneau, *Sanskrit and Sandhi Exercises*, University of California, Berkely, 1952

<sup>12</sup>F. Edgerton, *Sanskrit Historical Phonology*, Off-print 19, Publishers of the American Oriental Society, New Haven, 1946, pp. 38-40

<sup>13</sup>Marsh, "The Vedic Sibilants in Sanskrit", *JAOS*, LXI 1941, pp. 45-50

<sup>14</sup>A. Martinet, "Concerning Some Slavic and Aryan Reflexes of Indo-Europeans", *Word*, VII, 1951, pp. 91-95

<sup>15</sup>*Ibid.*, p. 91

This "high variant" would, through familiar processes of phonemic differentiation, divorce from original *s* and go to *ś*. This in turn, in Indo-Aryan, merges with the assimilation of 'k' in environments like \*ik't and \*ist to become ist, "when" as he puts it, "... (Indo-Aryan) developed cacuminal articulations.<sup>16</sup> A similar standpoint and approach is taken by Allen in his *Sandhi*<sup>17</sup> and in earlier articles dealing specially with retroflexion.<sup>18</sup> But the analysis and details are rather too elegant for the author to summarize.

Allen's analysis is based on Firthian doctrine of "prosody"<sup>19</sup> which plays down linear description of unitary segmental phonemes (particularly as it requires any positing of concepts like *Fernassimilation* in favour of longer than segmental stretches overlaid by prosodies of retroflexion or other characteristic timbre.

On this foundation Allen attempts to generalise data of phonetic interaction and unify apparently unconnected and disparate phonological phenomena.<sup>20</sup> As discussion will show, later in the article, his prevailing bias, with regard to retroflexion, is toward concepts which the author conveniently called "mutation". Such concepts figure importantly in the arguments of those who hold strong reservations toward the various doctrines of substratic influence, which is the next topic.

<sup>16</sup>*Ibid.*, p. 92

<sup>17</sup>W.S. Allen, *Sandhi*, The Hague, 1962

<sup>18</sup>W.S. Allen, see his 1951 and 1954 articles, cited elsewhere

<sup>19</sup>J R. Firth, "Sounds and Prosodies", *TPS*, 1941, pp. 127-141, see also his "Phonological Features of Some Indian Languages," *Proceedings of the Second International Congress of Phonetic Science*, Cambridge, 1936

<sup>20</sup>W. S. Allen, 1962, p. 21-22

## II

Most investigators of any authority see Sanskrit retroflexes as primarily the results of non-Aryan linguistic influence, from Dravidian, Munda, and perhaps other aboriginal languages. The rationale proceeds from the following postulates: retroflex phonemes, confined as they are to Indo-Aryan, cannot be native to Indo-European and are, therefore, secondary developments within Indo-Aryan, whereas in Dravidian and Munda, they are ancient and appear to be original.<sup>21</sup> Moreover, non-Aryan words with retroflexion occur in the very earliest Indo-Aryan texts. Such loans occur with mounting frequency as time goes on.<sup>22</sup> Hence, retroflexes implanted in Indo-Aryan via loans gradually spread due to bilingualism of non-Aryans obliged to adopt Indo-Aryan speech, and eventually became not foreign elements, but organic and systematic in Sanskrit.

All this took place well anterior to the writing down of the *Rigveda*, but the process, of course, does not end with Sanskrit. Over the centuries, the Indo-Aryan and non-Aryan languages have converged along a number of points in the linguistic continuum morphology, phonology, syntax—so that today, even though they derive from three distinct language families, all Indian languages partake in a *Sprachbund* in what Emeneau calls "linguistic areas."<sup>23</sup>

<sup>21</sup>A.A. MacDonnell, *A Vedic Grammar for Students*, Oxford University Press, 1916, p. 8 and 12, see also Edgerton, 1946, pp. 37, 42, and Burrow, 1965, p. 373.

<sup>22</sup>M.B. Emeneau, "Linguistic Prehistory of India," *Tamil Culture*, 38 (4), 1954, pp. 282-292, see also, 1956, p. 6-7.

<sup>23</sup>J. Bloch "Some Problems of Indo-Aryan Philology", *BSOAS*, V, 1930, pp. 731-33, see also Emeneau, 1956, p. 3-16.

The Dravidian and Munda admixture in Sanskrit presents large problems to investigators of historical and comparative Indian linguistics. Given the operative, organic status of retroflex sounds in Sanskrit, it becomes difficult finally to separate systematic phenomena of retroflexion in the Indo-European inheritance, from purely substratic occurrences (i.e. loans). While there are plenty of clear cognates to Indo-European etyma and hundreds of obvious loans, the exact etymology of many Sanskrit items is confused. The confusion is compounded by inter-dialectal borrowing in early Indo-Aryan as well as back-borrowing between Sanskrits and later Prakrits.<sup>24</sup> Folk-etymology re-interpretation add their mite, Munda or Dravidian loans with similar configuration of sounds becomes associated with native near-synonyms in Sanskrits.

In connection with these problems, Mayrhofer, who favours substratum theory, pinpoints the difficulty posed by this loan admixture but criticises the effort wasted on the futile search for what turn out to be false Indo-European etymologies.<sup>25</sup> Mayrhofer's stand is that most of the doubtful Indo-European etymologies can be better explained as Munda or Dravidian loans.<sup>26</sup> Yet he concedes that, inasmuch as too little is known about the non-Aryan languages, error may also have crept into such respectable loan-word compilations as that

<sup>24</sup>A. A. MacDonnell, *Vedic Grammar*, Strasbourg, 1910, p. 39, see also Edgerton, 1946, p. 43-44.

<sup>25</sup>M. Mayrhofer, "Neue Literatur zu den Substraten in Altindischen," *AO*, XVIII, 4, 1950, pp. 367-371.

<sup>26</sup>*Ibid.*, p. 367.

of Kuiper.<sup>27</sup> Kirfel<sup>28</sup> draws up lists that attempt to classify Munda and Dravidian loans by semantic groupings for their relevance to cultural history. Like Mayrhofer he advocates seeking the etymologies of doubtful items in the aboriginal languages, rather than in tortured Indo-European etymologies. The substratum theories then loom large in any account of the retroflexes and they have been the oldest explanations propounded.

A number of early contributions to substratum theories are cited in a survey by Pizzagalli<sup>29</sup> and I will mention some of them briefly for background. Caldwell was one of the first to suggest Dravidian origin of the retroflexes. His theories were widely accepted, and in fact, were shared by Pizzagalli's countryman I.G. Ascoli.<sup>30</sup> Buehler decided that the old Indo-Aryan had two retroflexes, *r* and *s*, which extended their influence and gave rise to the stops and to *n*. Bopp and Pott traced the retroflexes to the dentals in preconsonantal or word final environments, or under the influence of chuintantes, voiced, sibilants, *l* or *r*.<sup>31</sup> Thumb's explanation is almost the same.<sup>32</sup>

Pizzagalli's own conclusion is that retroflexes evolved in Old Indo-Aryan from what amounts to mutation within dialects in Vedic times.<sup>33</sup> Crucial to his

theory is the presence or absence of certain retroflex associated sounds in Eastern and Western dialects of the *Rigveda* or the Asokan inscriptions.<sup>34</sup> And he cites parallel allophonic behaviour of sounds contiguous to *r* in Iranian, Gypsy, Tokharian, English, and Slavic languages.<sup>35</sup> As to how Indo-Aryan dialects were motivated towards retroflexion, Pizzagalli refers vaguely to physical and psychic mutation, and to tendencies to extend and regularise retroflex features which were merely occasional and sporadic in the Vedas. These tendencies were reinforced by substratic pressure. The survey ends with S. Levy's evidence for an extensive, Pre-Dravidian, Kolarian substratum; and speculation that the Dravidians may have been a Mediterranean race that came in via Mesopotamia.<sup>36</sup>

In addition to Mayrhofer and Kirfel, there have been other recent important contributions to substratum theory.<sup>37</sup> B. N. Prasad<sup>38</sup> employs Allen's and Firth's concept of "prosody" and asserts that retroflex sounds being of a "harsh" nature are put to conscious use in terms that have to do with awkward, disgusting, or onomatopoeic concepts. He advances one theory that they are developed from a tendency to harshen the dentals under Dravidian influence, as well as via heavy borrowing through Sanskrit, Middle Indo-Aryan and New Indo-Aryan times.

<sup>27</sup>F. B. J. Kuiper, *Proto-Munda Words in Sanskrit*, VKNAW-Afd. Letterkunde--NS 51(3), 1948, pp. 176, see also Mayrhofer, 1950 pp. 371.

<sup>28</sup>W. Kirfel, "Die Lehnwörter des Sanskrit aus den Substratsprachen und ihre Bedeutung fuer die Entwicklung der Indischen Kultur," *LEXIS*, III, 1952, pp. 267-285.

<sup>29</sup>A. M. Pizzagalli, "L'origine delle Lingue nell'Antica Indiana e l'Influsso Dravidico," *Arch. Glott. It.*, XXII-XXIII (Melanges Ascoli) 1929, pp. 152-169.

<sup>30</sup>*Ibid.*, pp. 152-158, 161.

<sup>31</sup>*Ibid.*, p. 160.

<sup>32</sup>*Ibid.*, p. 161.

<sup>33</sup>*Ibid.*, pp. 153, 161.

<sup>34</sup>*Ibid.*, p. 162.

<sup>35</sup>*Ibid.*, p. 164.

<sup>36</sup>*Ibid.*, p. 167.

<sup>37</sup>T. Burrow, (seven articles in *BSOS*, 1939-49, *BSOAS*, 12, 1948, 365); Canedos (Emerita V. 8, 48 ff., V. 9, 113 ff.), both cited in Mayrhofer, 1950.

<sup>38</sup>B. N. Prasad, "A Phonaesthetic Aspect of Retroflexion," *IL*, XVI, 1955, pp. 309-12.

S. K. Chatterjee<sup>39</sup>, in addition to early mutual influence by and between Indo-Aryan and Dravidian, refers to Austic and Mongolic influence in Pre-Vedic times. He makes the point that conquered people must have profoundly modified the Aryan language when they adopted it as a lingua franca in North India.

Emeneau<sup>40</sup> is one of the most prominent advocates of substratum theory. He contends that as their incidence increases steadily throughout the Aryan-non-Aryan contact, retroflexes gradually arose because of bilingualism, even though they often appear in conditions that are reflexes of Indo-European clusters. In support of his theories he cites the extremely early appearance of the non-Aryan features in Sanskrit, derived from Dravidian; and the fact that in Dravidian the range of retroflexes is not conditioned as it is in Sanskrit, but original, deriving from Proto-Dravidian. These factors, plus the early and protracted intercourse, led to bilingualism and permitted allophonic retroflexes to 'become phonemic in Aryan speech.

Emeneau discusses the role of inter-dialectal loans in Old Indo-Aryan with regard to anomalous occurrences of retroflexion.<sup>41</sup> A lengthy article by Vorob'ev-Desyatovskiy (abbreviated V. D.) makes many of the points discussed above, concerning substratic influence. V. D. states that retroflexes developed in Indo-Aryan family under Dravidian influence. He says that Dravidian tribes flourished all

over the subcontinent; and their language was common all over the said area. He cites bilingualism as the main cause of Indo-Aryan-Dravidian convergence. But the history of Aryan migrations and the varying character of their contacts with Dravidian and Munda postulations led to various influences upon Indo-Aryan evolution in phonology and grammar. This is particularly shown by comparing the radically influenced Inner Group (South, East, and Central India) with the conservative Outer Group (North and West India) of Indo-Aryan language.<sup>42</sup> In spite of this divergence, no Indian language lacks retroflex phonemes. They occur in Indo-European cognates as well as in obvious loans in all the Indo-Aryan languages.<sup>43</sup> V. D. concludes that substratic influence may be direct, i.e. via lexical loans which introduce new features. But that the borrowing language does not necessarily adopt the system these loan-features represent in the substratum. The loan features from Dravidian developed independently, following tendencies internal to Indo-Aryan proper.<sup>44</sup>

A good number of linguists and language specialists have raised objections to the substratum explanation of retroflex phenomena.

Pizzagalli, citing Wackernagel for support, argues that the Dravidians couldn't have affected Sanskrit, because the zealous *rishis* (saints or sages) would have defended the sacred Vedas from mispronunciation by the 'inferior' aborigines. More to the point, he cites J. Hertel to the effect that part of the *Rigveda* was

<sup>39</sup>S. K. Chatterji, "Dravidian Philology", *Tamil Culture*, 6, pp. 195-225.

<sup>40</sup>M. B. Emeneau (1954), pp. 282-292 (1956), p. 6-7.

<sup>41</sup>*Ibid.*, "The Dialects of Old Indo-Aryan," *Ancient Indo-European Dialects*, Proceedings of the Conference on Indo-European Linguistics, UCLA, April 25-27, 1963.

<sup>42</sup>V. S. Vorob'ev-Desyatovskiy, "O Rol'i Substrata v Razviti'i Indo-ariyskikh Yazykov," *Rocznik Orientalistyczny*, XXI, 1957, pp. 501-15.

<sup>43</sup>*Ibid.*, p. 508.

<sup>44</sup>*Ibid.*, p. 515.

composed on Iranian soils where aboriginal speech influence would be small or almost zero.<sup>45</sup> Louis Renou notes the existence of a "substrat Dravidian" all right, but contends that the "principle" motivating retroflexion was already "amorce" in Indo-Iranian, although Sanskrit was to bring it to its greatest extension.<sup>46</sup> He adduces phonetic motivation for the phenomenon.<sup>47</sup> J Bloch<sup>48</sup> recognizes the role of substrat in language change, e.g. such *Sprachbund* developments as South Caucasian, Armenian, Celtic, Romance, and Non-Aryan Aryan.<sup>49</sup> But he sounds a number of cautions: Indo-Aryan develops initial retroflexes increasingly through the years, whereas Dravidian retroflexes are very many in number; many of them developed from dentals and palatals in Pre-Sanskrit times via the influence of *r*, or the chuintantes.<sup>50</sup> He contends that all in all, Aryan, specially the Vedic, has taken in little that is Dravidian, and that many loans, attested in Sanskrit but not in the Prakrits, simply got mixed into the writings of "provincial" literati.<sup>51</sup>

One good point made by Bloch is that vocabulary loans are special and conscious. They do not naturally alter a language, the way phonological and grammatical admixture do, but merely enrich it. Hence, loanwords alone are certainly insufficient to account for phonological change.<sup>52</sup> Bloch also discusses the confusing effects of Prakrit back-loans, and to the retroflex attraction exerted by foreign near-synonyms with sound

patterns similar to Aryan words.<sup>53</sup>

Allen seems to have made the most telling contributions to non-substratum explanations of Sanskrit retroflexion, although he has adduced purely phonetic postulates rather than allude to the substratum theories *per se*. In his writings he correlates phonetic facts of retroflexion with what he calls *R*, *Y*, and *W* prosodies. These, he illustrates, are early features common to Indo-Aryan, Indo-Iranian, and Balto-Slavic. But while in Indo-Aryan, the features became active in composition—hence productive—equivalent features in Indo-Iranian and Balto-Slavic remained unproductive. In his article entitled "Retroflexion in Sanskrit Prosodic Technique and its Relevance to Comparative Statement," Allen cites Meillet for a phonological statement "Après...*r*, l... en Indo-Iranien, l'articulation de \**s* se transforme encelle des chuintantes: skr *s*, av. *s* - en slave, *x* a pris la place de l'ancienne chuintante." Interpreting this data, Allen adds information from Morgenstierne's study of the Ashkun Kafirs ("The Language of the Ashkun Kafirs," *NTS* II, 1929) which Emeneau (1963, 138, citing Morgenstierne *NTS* XIII, 1945) concurs in adjudging an unusually archaic member of Indo-Aryan. If the Kafiri parallels hold true, it lends support to Allen's prosody based theories of original mutation toward retroflex *s*.

What determines whether the process becomes active or stillborn? Allen links the retroflexive coloration of Sanskrit *s* to the "simple" fact that retroflex prosody has already been established in Sanskrit in connection with *r*. An *R*-prosody is lacking in both Avestan and Balto-Slavic. The theory, Allen states in the end, has far-reaching implications for the comparison of Indo-Aryan-Indo-Iranian-Balto-Slavic connections—once it can be fully developed and rigorously applied.<sup>54</sup> □

<sup>45</sup>Pizzagalli, 1956, p. 163

<sup>46</sup>L. Renou, *Histoire de la Langue Sanskrite*, Lyons/Paris, 1956, p. 9

<sup>47</sup>*Ibid*, pp. 9, 16

<sup>48</sup>J. Bloch, *op cit*, 1930

<sup>49</sup>*Ibid*, p. 731

<sup>50</sup>*Ibid*, p. 732

<sup>51</sup>*Ibid*, p. 744

<sup>52</sup>*Ibid*, p. 735

<sup>53</sup>*Ibid*, p. 746

<sup>54</sup>W. S. Allen, *op cit*, 1954, p. 565

# Linguistics in Language Teaching

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EXCERPTS FROM PETER STREVINS

THE PRIMARY and most obvious function of linguistics in language teaching lies in providing for teaching purposes descriptions of the languages being taught that are more accurate and useful than those that have conventionally been used

Once sufficient descriptions of languages exist, it becomes possible to embark upon a second stage in the improvement of language teaching textbooks and materials, by preparing illuminating comparisons. It is axiomatic that if two pupils with the same mother tongue learn the same foreign language, they will encounter largely similar problems and difficulties; pupils with a different mother tongue will encounter different problems; the recurrent difficulties of any individual pupil reflect the similarities and differences between his own language and the language he is learning; the most appropriate materials for teaching a language are those which embody a bi-lingual comparison sometimes called a contrastive analysis of the mother tongue and the target language,

The theoretical desirability of comparison is perhaps obvious, unfortunately, even in Europe, which has relatively few languages to compare with one another, and where the total number of contrastive studies needed to cover all the main language-learning populations, is relatively small (compared with, for example, Africa), very little progress has been made toward this aim. The reason for this lack of progress is that comparison presupposes description on the same descriptive basis, and even a body of good, modern descriptions of languages is lacking for much of Europe.

Allied to the need for research on further descriptions of languages, then, is the subsequent but equally important need for comparison between descriptions. These descriptions and comparisons need to be made with an adequate background of training in modern descriptive linguistics and phonetics if the data are to have the validity and authenticity which the profession requires. □

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# Language Study in India

## A Survey

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IN INDIA modern linguistics came into shape about 200 years ago. William Jones (1746-94), an English scholar, gave a lecture on the close similarity between Sanskrit and Greek and Latin and presumed a common origin for all these. This gave rise to comparative linguistics. European scholars, awakened to the new discipline, began a methodical comparison of the languages of the Indo-European family and later other language families were also studied. The language comparison created interest in the changes in the languages themselves and gave rise to historical linguistics.

Most of the scholars who studied Indian languages were European, parti-

cularly missionaries and service personnel. Their interest was manifold—writing grammar or comparative studies (called comparative grammar) of Indian languages, translating the Bible into Indian languages, and preparing language teaching materials for major languages. Bishop R.C. Caldwell produced *Comparative Grammar of the Dravidian Languages* in 1858. Pischel wrote in 1900, *The Grammar of Middle Indo-Aryan*; Jules Bloch wrote *Indo-Aryan Language*. Other writers on Aryan languages include Gilchrist (*Grammar of the Hindustani Language*, 1803), Sir Ralph Turner (*A Comparative and Etymological Dictionary of the Nepali Language*, 1931), Rudolf



Hoernle (*Grammar of the Eastern Hindi*, 1880), John Beams (*Comparative Grammar of Modern Aryan Languages of India*, 1870), Kellogg Rew (*A Grammar of the Hindi Language*, 1875). Works of other Indian languages include a grammar of Malayalam by Dr Gundert, Gujarati studies by Turner, Tisdale and Tessitori, structure of Marathi by Jules Bloch, linguistic studies of Tamil by G. U Pope and Kamil Zvelebil, and a grammar of Kannada language by Kittel, and a Sindhi grammar by E. Trump. These exemplify the amount of work put in by the foreign scholars. But there was a group of Indian scholars like Bhandarkar who were trained in the traditional system of language studies and who produced grammar, lexical studies, etc in their respective languages.

A notable contribution to the linguistic studies in India was the monumental work of surveying Indian languages. Sir George A. Grierson, who launched this project in 1894, was a polyglot and had a deep interest in languages. The findings of the survey have been published in 11 volumes. It was a scientific attempt at giving linguistic description of Indian languages and re-defining the concept of language families in India. The work, in spite of many methodological constraints and faulty or hasty conclusions, gave impetus to other scholars, especially to the Indian scholars, to check and test the validity of his statements.

Modern descriptive linguistics came to shape only in the beginning of this century. Sansure in France and Bauduin in Russia can be called the pioneers in the field of descriptive linguistics, later joined by J R. Firth, E Sapir, O Jespersen, etc. The developments abroad were reflected in India, too. L. V. Ramaswami Ayyar wrote on

Malayalam phonology and morphology (1927-1938), Dr. Suniti Kumar Chatterji produced *The Origin and Development of Bengali Language* in 1926. Sukumar Sen followed the steps of Chatterji. The Tamil language was enriched by Meenakshi Sundaran, who produced *A History of Tamil Language* (1965). The Hindi scene was dominated by scholars like Dr. Dharendra Varma (*Brajhasha Vyakaran*, 1934), Dr. Baburam Saxena (*Evolution of Avadhi* (1937), and Siddheshwar Varma. Dr. S M Katre worked for the development of Marathi linguistics. The first batch of scholars of linguistics paved the way for the establishment of the Linguistic Society of India as a registered body in 1954 in collaboration with the foreign scholars like Fairbanks, Gleason and Gumperz. With the establishment of the Society, most of the scholars went either to the U K. or U. S. A. for training in linguistics. The middle rung of linguists include scholars like A.M. Ghatage, A R. Kelkar, M.A. Mahendale, Krishnamurthy, P.B. Pandit, C.R. Sankaran, V I. Subramanian, H.S. Gill, Hardev Bahu and U N. Tiwari and many others.

The study of linguistics in India further progressed when new departments of linguistics were opened in various universities. These departments were manned by linguists of the second and third era, who trained a new generation of young scholars. The linguistic studies were augmented by the departments of languages also, which were run by scholars trained in linguistics.

The history of the development of linguistic studies in India has three main currents: (i) the traditional school of scholars who took interest in the description of language, (ii) the new school of linguists whose source of inspiration was

the development in linguistics at the linguistic centres abroad, and, (iii) the group of scholars from the departments of (Indian) languages, who specialised in linguistic studies. With a view to understanding the nature and development of respective languages and their functions (especially in literature), these scholars turned towards Indian languages for their research and a vast body of literature has been produced collectively by these on the history and description of Indian languages and dialects.

The departments of linguistics in India have been keeping in step with the latest developments in the linguistic centres abroad. Thus, linguists have found for themselves a more enviable, but nonetheless much restricted area of study.

#### *Teaching of Linguistics in India*

The study of linguistics as part of the university curriculum is very recent in India. It was taught in the name of philology or comparative philology in the university of Calcutta, Poona and Annamalai, which, in fact, are the old centres of linguistics in India. With the advent of the middle rung of scholars, more centres of linguistic studies were opened during the last two decades. But, they could not catch up with the speed in university education. Linguistics departments in India are so few that they can be counted on fingers. The important centres are Delhi, Patiala, Tiruvandrum, Bombay, Baroda, Agra, Hyderabad, Aligarh, Dhairwar, Kurukshetra, Raipur, etc.

Most of the universities attach the linguistics department to some language department. The chances of graduates getting employment are too slender to attract a sizable number of students. Linguistics, in spite of its importance in

the nation's life, is not taught outside universities and introducing linguistics in the undergraduate syllabus has been a failure in India. One can ascribe the state of affairs to the failure of the departments of linguistics to modify their courses to suit the needs of the society (and it would be possible only when all linguists stop looking for inspiration from foreign universities and scholars).

In accordance with the decision of the Government of India to establish one or more centres of advanced study in each discipline, two such centres were established at Annamalai and Poona universities. These centres were given enough resources to organise research programmes and enhance linguistic studies in India. These centres have been doing commendable work.

#### THE LINGUISTIC SOCIETY OF INDIA

This Society was founded in 1928 at Lahore and Dr Taraporewala became its first President. Dr. Siddheshwar Varma and Dr. S. K. Chatterji took a keen interest in its working. Due to financial crisis its venue was shifted to Calcutta in 1937. The Society was registered in 1954. Its venue was again shifted to Poona and the Indian Philological Society functioning there was merged with it later.

Before its shifting to Poona, the Society had published 15 volumes of *Indian Linguistics*. This journal is coming out regularly as a quarterly. The Society has published several books and monographs.

The notable contribution of the Society to the cause of linguistics is its programme of organising summer/winter schools. The first of such schools was conducted in 1954 in Poona. Later, these

schools were dropped under the assumption that it should be the duty of the departments of linguistics to take up this job. Whereas the departments train a select few in the linguistic sciences, the summer schools of the society have been imparting knowledge of linguistics to persons employed in the applied fields of language as teaching, translation, etc. The language institutes of India can meet just a small fraction of the demand. Hence, the summer/winter schools should be organised on a larger scale in collaboration with the language institutes.

### *Language Centres*

The Government of India, in pursuance of its policy of fostering the study of Indian languages, has established four language institutes which have come to be known as important centres of applied linguistics of respective languages. These are engaged in the work of training language-teachers on modern linguistics-oriented lines and conducting language courses. They organise research, publication and extension work and produce teaching materials for respective languages.

The Central Institute of English and Foreign Languages, Hyderabad, was established in the year 1958. In addition to English, it offers courses in German and French. It affiliates various English language teaching institutes for conducting training programmes for English teachers. It has one centre in Shillong.

The Central Institute of Hindi, Agra, was established in 1961 for the propagation of Hindi teaching and training the Hindi teachers. It organises teaching programmes and conducts examinations for some States in India. It has one centre in Delhi and expects to establish two more centres, one in the south and

another in the east.

The Rashtriya Sanskrit Sangathan, Delhi, was established in the year 1962, to further the cause of Sanskrit studies in India. It has five centres in India, where training programmes for Sanskrit teachers are conducted.

The Central Institute of Indian Languages, Mysore, was established in 1969. Besides Mysore, it has four centres at Poona, Mysore, Patiala and Bhubaneswar where teachers are trained in one of the languages of the region as a second language.

These institutes have an impressive list of publications to their credit. They offer research guidance to Ph.D. scholars of the universities that have recognised them as research centres.

Central Hindi Directorate is a subordinate office of the Ministry of Education, Government of India. It stands merged with the Commission for Scientific and Technical Terminology which was charged with the work of preparing technical terminologies for different disciplines. In addition, it conducts correspondence courses for teaching Hindi and handles other projects of dictionary-making (especially bi-lingual).

The need for adopting Indian languages as medium of teaching necessitated production of higher level books on different subjects and their introduction as state languages (in addition to their being medium) created the need for technical terminologies. The Commission for Scientific and Technical terminology produces glossaries in Hindi. The States have their own agencies for producing glossaries. These agencies are generally constituted by persons drawn from language and linguistics departments. The State level Granth Academies are responsible for the production of text-

books (translated or original) up to the university level.

*Other Agencies, Publications, etc.*

There are many private publishers and other agencies who are publishing works on English and other European languages. Publications from institutions, universities and government agencies alone constitute the major portion of linguistic and language work in India.

There are only a few magazines on language and linguistics in India. The *Indian Linguistics* has a long history. Other notable magazines are *Indian Journal of Applied Linguistics*, Delhi, *Indian Journal of Dravidian Linguistics*, Trivandrum, *The Journal of Linguistics*, Calcutta, and *Journal of the School of Languages*, JNU. A useful magazine, *Psycholinguia* from Raipur has been wound up. Among the Hindi magazines *Bhashiki* is irregular. *Gaveshna* from the Central Institute of Hindi, C.I.E. Bulletin, *Bhasha* from the Central Hindi Directorate are good publications from government agencies.

*Language Teaching in India*

So far, the only kind of language teaching we have witnessed in India, especially before Independence, is the teaching of the regional languages as mother tongue. English was the only second language. The nature and level of teaching English in India has been conditioned by various circumstances. Now that Indian languages are gaining ground, the teaching of English is at its low ebb. Hindi is being taught as another second language throughout India.

Both English and Hindi have been holding the position of *lingua franca*.

Hence, we, in India, do not really know the way of or implications of teaching a second language. The language departments organise courses in teaching second/foreign languages. But they have failed to catch up with developments in the field of language teaching and do not cope up with the demands of a multi-lingual country as India, in planning and implementing a proper national policy of language education. The language teaching in India suffers from the absence of defined educational goals and linguistic targets, lack of trained personnel, failure in producing effective language curricula and syllabi and teaching materials.

In the training colleges, where language methods are taught, the training is outdated and language is not thought to be any different from other subjects.

*Conclusion The Need of the Day*

Since India is a vast country of many peoples, customs and languages, the problem is that of communication and integration—coming together and being together. Languages have a special place and role to play in integration. But in spite of their importance, there is not a high-power government machinery to look into the multifarious activities and problems. And the establishment, in 1975, of a Department of Official Language in the Ministry of Education only peripherally touches the problem.

The departments of linguistics should gear themselves to the work of scientific description of Indian languages with a view to analysing language universals of the regions, and they should undertake socio-linguistic survey of India and evolve a proper language policy for India. □

## Milton's Misogyny

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ADARSH BALA

MISOGYNY is a common charge against the king of poet, John Milton. It is also said that Milton was a harsh and strict father and a morose husband. His view of woman's function and capacity is considered to be beneath the dignity of the sex. Some approval is lent to this view when lines like those quoted below are brought forward as illustrative of his attitude.

Cries Adam:

*Oh, why did God,  
Creator wise, that peopled highest Heaven  
With Spirits masculine, create at last  
This novelty on Earth, this fair defect  
Of nature, and not fill the World at once*

*With men, as Angels, without feminine*

It is a cry in which the critics hear the poet's own voice:

*Nothing lovelier can be found  
In woman that to study household good;  
And good works in her husband to promote.*

Milton wished his daughters to learn only one language, for that, in his opinion, was enough for a woman. Adam, at one place, thus condemns Eve's want of decorum:

*Longing to be seen  
Though by the Devil himself.*

In Milton's Delilah we find the culmination of his feelings against woman. She has been painted cunning, treacherous and lustful, hypocritical in love and religion; impatronic and beautiful, yet "cleaving mischief" a "specious monster". The comments of the chorus on Delilah embody the strongest condemnation of womanhood.

### *Beyond Misogyny*

All these statements and such others like this appear to be an indictment of woman. But they present only one aspect—the dark side—of the picture. They have often caused wrong judgements on Milton's view of woman. It is, indeed, possible to array, as against these, ample evidence to show how much Milton loved and honoured women. The 'Divorce Tracts' describe the happiness, comfort and help that woman can give in home life. The 'Honoured Wife of Winchester', the Italian 'Sonnets' and 'Comus' clearly reveal a feeling of reverence for the fair sex. In the sonnets expressly dedicated to women, Milton presents four beautiful types of womanhood—(i) the virgin, (ii) the noble matron, (iii) the Christian lady, (iv) the ideal wife. Above all, the poet whose imagination created the Eve of *Paradise Lost* and who eulogised her in the following lines:

*All higher knowledge in her presence falls  
Degraded, wisdom in discourse with her  
Loses discountenanced, and like Folly Shows;  
Authority and reason on her wait.  
As one intended first, not after made  
Occasionally; and to consummate all  
Greatness of mind and nobleness their seat  
Build in her loveliest and create an awe  
About her, as a guard angelic placed,*

he could not have despised woman.

Milton's real view of women and his conception of the relation between the sexes can be constructed in outline from hints collected from two sources. (1) *Paradise Lost* and (2) the *Divorce Tracts*. His attitude in this regard is implicit in his conception of Eve and her relation to Adam; while it is explicitly stated in the 'Doctrine' and 'Discipline of Divorce' and 'Tetrachordon'.

### *Lonely without Eve*

How does Milton characterize Eve? In Eve, it is said, Milton has pictured the Eternal Feminine. She is the primeval woman and Adam the primeval man. Adam is the first to be created, and Eve, "the nice and subtle happiness" is created out of a rib from his side. Why? The only answer is that Adam was "alone" without Eve. Why alone? Milton has argued this point convincingly in 'Tetrachordon'. "Adam had the company of God himself and angels to converse with; all creatures to delight him seriously or to make sports. God could have created him out of the same mould a thousand friends and brother Adams to have been his consorts, yet for all this, till Eve was given him, God reckoned him to be alone". Eve is part of Adam's soul, his other half: "bone of my bone, flesh of my flesh.. ."

Woman thus is essential to man. Both the sexes are necessary to each other. Some would consider them necessary in the sense of procreation merely. But this, to Milton, is a "crabbed opinion" who thinks "that these is a peculiar comfort" that woman gives "beside the genial bed, which no other society affords". Woman is necessary, as Saurat has pointed out (1) for satisfaction of man's normal desire, and (2) for a special sort of intellectual intercourse not to be had between men.

*Not Equal*

The question arises what is woman's position vis a vis man? The poet's view may be studied from the scenes in which Adam and Eve are introduced. The relation is summed up pithily in the phrase "not equal".

- though both

*Not equal, as their sex not equal seemed.  
For contemplation he and valour formed,  
For softness she and sweet attractive grace,  
He for God only, she for God in him*

Woman is of a frailer constitution than man. She is of a softer build, and possessing sweet attractive grace. She is full of love, but her love is given with "sweet reluctant amorous delay". She is the fairest of all the gifts of the Deity blushing like the morn. The position assigned to her in God's plan is succinctly given in the line: "He for God only - she for God in him." Adam's highest relation is not to her but to God: she is to look up to Adam, as he to God. She is "not equal" to but dependent on Adam, and is created to minister to his wants.

The inferiority of woman's status is quite patent, and both Adam and Eve are conscious of it. Yet it must be noted that though woman's status is not as high as man's, she has a mysterious power before which he is likely to quail. That power is "female charm".

*Transported touch' her passion first I felt,  
Commotion strange, in all employment else  
Superior and unmoved, here only weak  
Against the charm of beauty's powerful  
glance*

Harmony between man and woman can be established and they can reach the "fulness of their powers, the sum of their

humanity", only when their mutual relations are properly adjusted, that is, when man ultimately dominates woman. Eve, as characterized by the Angel, is

*Fair no doubt, and worthy well  
Thy chershung, thy honouring, and thy love,  
Not thy subjection ..*

God thus reprimands Adam in his transgression

*Was she made the guide,  
Superior, or but equal, that to her  
Thou didst resign thy manhood.. ?*

*Woman in the Bible*

In this connection, it is interesting to study the Biblical idea of woman and observe that there is something in common between the views of Milton and those expressed in the Bible. "The head of the woman is the man" (*I Corinthians*, xi, 3). Wives are called upon to submit themselves to their husbands, for the husband is the head of the wife, even as Christ is the head of the Church (*Ephesians*, v, 22, 23). "Ye wives, be in subjection to your husbands" (*I Corinthians*, xi, 3). Yet the husband is for giving honour unto the wife as unto the weaker vessel, and as being heirs together of the grace of life" (*I Peter*, iii, 7).

It is clear from these observations that woman's intellectual and moral attainments do not come up to the level of man's. Man is made to command and woman to obey, he is to exercise sway over her. Not intended to participate in the struggle of life, she has "a weaker physical" and also perhaps "a weaker intellectual and moral constitution." Her sphere of work is determined by her duties to her husband. Her sphere may be subordinate, but it is not unworthy. Her

feminine grace and charm have a value of their own. But for her man's life would not only be dull but meaningless. Besides "She no less than man is made in the moral and spiritual likeness of his maker, is a moral agent liable to a like temptation, has a like soul to be saved; is destined to a like immortality of bliss."

It is perhaps in Milton's prose works that we find a clear picture of the ideal union of man and woman. "The conjugal tie implies spiritual reciprocity between them." She should play her legitimate part in man's life, not only in the lower physical, but also on the higher spiritual plane. "It is not good that man should be alone," commands the Bible and "alone means without woman," not, as we have already noticed, in the sense of procreation merely, but also from the point of view of intellectual and spiritual companionship. That woman, being inferior in mental constitution, cannot sufficiently stimulate man's thoughts, nor contribute in any considerable way to their development is a wrong notion. Milton thought that man's intellectual intercourse with woman, often proved to be "a strenuous battle of ideas," leading to sharp and irritating conflict of opinions; whereas there was something highly soothing in the mind of woman that makes conversation with her particularly pleasing. She improves upon man's ideas, not by contesting them but by picturesquely decorating them, and by giving them a peculiar colouring through her fine sensibilities.

### *The Essential Difference*

There is thus an essential difference between woman's nature and man's. But one without the other is incomplete. A

perfect life means complete harmony between them in all human activities: physical, intellectual, moral and spiritual. But this harmony does not imply any aggressiveness on the part of man and slavish passivity on that of the woman; it is the result of mutual understanding and cooperation. Saurat has convincingly refuted the charge that chivalry is lacking in the Miltonic conception of woman by pointing out that Adam gave away his all and deliberately chose to join Eve in sharing the punishment. To Milton, the subtle charm of life is felt when intellect itself lets go its hold and surrenders to "living beauty."

For a correct assessment of Milton's attitude towards woman we should not fail to take note of two points: (i) the view of woman held in the age in which he lived and (ii) his personal experience. In his age there were two opposing parties in England, the Puritan and the Cavalier. The Cavalier looked upon woman as a superior being, in refinement and grace; a being worth living for and dying for. The word 'Chivalry' was the key-word, expressive of the Cavalier attitude towards woman. In complete contrast, the Puritan considered chivalry as an unsatisfying creed. He was a strict follower of the doctrine, "woman was made for man." To him man was the real cause of God's creation, and woman was there to minister to this noble being.

### *The Cavalier and Puritan Meet*

In Milton's attitude towards woman we find a subtle reconciliation of the two viewpoints. He carves out a middle course between the "exaggerated Cavalier chivalry" and the extreme "Puritan austerity." He modifies the fundamentally Puritan view "woman for the sake



of man" by raising her to a status of equality with man, by emphasising the essential value of her participation in his life's multifarious activities. Raleigh has drawn attention to the dialogue between Adam and Raphael, in Book VIII of *Paradise Lost*. Adam praises Eve.

*When I approach  
Her loveliness, so absolute she seems  
And in herself complete ..  
All higher knowledge in her presence falls  
Degraded...*

That is a praise eminently worthy of the object on which it is lavished. Raphael, however, feels that Adam is overdoing his part, and scents danger in his "Cavalier attitude." Note his highly significant reply.

[illegible]

That is almost a rap on Adam's knuckles. Which of these passages is an expression of Milton's own view? The contrast is no doubt baffling to the readers. Truly has Raleigh observed that one passage is as much expository of Milton's conception as the other. It has been observed that "The Cavalier and Roundhead jostle in Milton." Viewed in the light of this remark, the apparent disparity showed in the two passages resolves itself. The assertion may further be confidently made that Adam's Confession comes from the Cavalier side of Milton while Raphael's reproof represents the puritanical modification of the Cavalier views.

### *The Poet's Personal Life*

The bitterness caused by his unhappy experience in regard to his relations with his first wife Mary Powell seems to have sunk into the poet's soul and consequently some of his reflections on woman have a curious personal ring about them. Milton was disposed to generalize from personal experience. Adam, finding what mess Eve had made of his fortunes, bitterly complains of "innumerable disturbances on Earth through female snares."

The following lines would forcefully remind the reader of the poet's own unhappy memories of his first marriage.

For either

*He never shall find out fit mate,  
As some misfortune brings him, or mistake,  
Or whom he wishes most shall seldom gain,  
Though her perverseness, but shall see her  
gained  
By a far worse, or if she love, withheld  
By parents, or his happiest choice too late  
Shall meet, already linked and eia block  
bound  
To a fell adversary, his hate or shame.*

In *Samson Agonistes*, Milton projected his personality to a considerable extent. In presenting Delilah, his feelings became so intense that even the statements of the Chorus reflected his personal statements, whereas the Chorus as the ideal observer ought to have presented a saner and more dispassionate view. Two other instances of Milton's feeling against woman have been noticed—his speaking of the warrior-queen Boadicea as a "Virago" and his ignoring woman altogether in his tract on Education. But with all this, we must not forget that Milton, who could pen such praise of woman as he puts into the mouth of Adam, had certainly no low

ideal of what a woman may be. Eve, as drawn by Milton, has an irresistible charm, and is infinitely more interesting than Adam. Milton was not a "callous or morose puritan." He was, in reality, a child of the Renaissance, just turned Puritan, and as such could be no "purblind misogynist." Perhaps the view of St Augustine coincides with Milton's view.

If God had meant woman to rule over man, He would have taken her out of Adam's head; had he destined her to be his slave—from his feet. But God took the woman out of man's side, for He made her to be an helpmate and an equal to him. □

## Research in Education at Sri Aurobindo Ashram<sup>1</sup>

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*Registrar, Sri Aurobindo International Centre of Education, Pondicherry*

EDUCATION primarily aims at preparing the child and the youth for life. But what is life? And what is the aim of human life? The nature of education will depend upon the answers that we give to these basic questions.

Research in education as conducted at the Sri Aurobindo Ashram starts from an inquiry into these basic questions and this has resulted in a formulation of what can most properly be called "science of living".

All life, we find, is an affirmation and a growth, a pulsation of an interplay of forces, seeking blindly or half-unconsciously and half-consciously some deepest satisfaction in which it may find its resting-place or assured stability or equilibrium.

There are three fundamental and powerful, but conflicting, views concerning the goal or aim that life seeks to realise.

According to the first, all life is an ignorant movement seeking for Knowledge, which, however, can be found only by the cessation of Life, which in turn

can be achieved only by the realisation of the supracosmic static Self or featureless Nirvana.

According to the second, all life here is a preparation for a life elsewhere on a supraterrrestrial plane, conceived either as a paradise or a heaven or an abode of perpetual joy and bliss.

According to the third, which is very much in vogue today, the aim of life is to affirm itself here in this world, on earth itself. There is, according to this view, nothing beyond this cosmos, or even if there be anything beyond this cosmos, the aim of life has nothing to do with it, either because the connection of life with that beyond cannot be known or because life here is so preoccupying and absorbing that it does not inspire us, or leave us sufficient time, to inquire into that beyond.

All these three views have been deeply studied at the Ashram and our conclusions are given below.

Each one of the above views answers to the aspiration of one or more of the

<sup>1</sup>Full text of the Address is available on request.

elements in the human personality, but in the human personality these elements are found to be coexistent, though not integrated as yet..

And when the integration of these elements is effected, we find a clue to the reconciliation of the above three seemingly opposite views of the aim of life. We find then the exact relationship between the supracosmic, the supraterrrestrial and the terrestrial, and of all these with the individual striving and growing on the earth. It is then realised that the supracosmic, the supraterrrestrial and the terrestrial are the three terms of reality, the last two rooted in the first. The will to realise the self-fulfilment and perfection here on the earth is not a vanity or a perversion, only its unwillingness to look beyond is a self-defeating limitation, for the complete self-fulfilment on the earth can be attained only by a union with the supracosmic and by a journey through the supraterrrestrial and terrestrial planes and by preparing and realising the harmonisation and perfection of the principles and powers of the embodied existence here.

Education then must be a preparation for such a journey, such an adventure, such a seeking and a realisation of harmony and perfection...

#### *An Evaluation of Experiments in Education*

It is recognised that in the history of the development of education, we find in certain systems of education a stress on a harmonious development of the physical, the vital and the mental. Such indeed was the Greek ideal of education, which has reappeared in the modern West, and which influences the modern educational thinking in India. It is also recognised that there have been systems of education laying a great stress on the building up of

the character and on the inculcation of the moral virtues. In some systems of education, an attempt has been made to provide for the study of some religious texts and for some religious practice. There is also a tendency to suggest a system of education in which all the above elements would in some way be incorporated.

The system of integral education, as being experimented at the Ashram, accepts the truths and values underlying all the above mentioned systems of education, but it is identical with none of them. It does stress the harmonious development of the physical, the vital and the mental, but the harmony is sought to be achieved not by any mental, or moral or religious idea or system, but by an uncompromising stress on an inner seeking and discovery of the psychic and spiritual principles in the personality.

Such a system of education is unique and unprecedented, for even in ancient India in the Ashrams of the Rishis, where spirituality was not life-negating and where there was an attempt at the integral development of the various parts of the being by the stress on the inner psychic and spiritual seeking, even there the aim of the complete spiritualisation of life here on the earth was lacking or was not yet fully put forth. Indeed, the educational system of the ancient spiritual Ashrams has been a most valuable gift and, even when our aim is not absolutely identical and we have to hew out new paths in education, many of the characteristics of our endeavour will bear close resemblance or even show identity, both in spirit and form, to those which obtained in the ancient Ashrams. The integral system of education is thus in a sense a continuation and enrichment of the ancient Ashram system; but it is also a new

creation, with a more radical and perfect spiritual aim, and in the conditions of the modern world which are very much different from those of ancient times. Fresh and more complex problems of education have to be met in this new endeavour and research. There is no doubt that if education has to reconcile the underlying values of modern science, technology and the dynamism of life with the spiritual ideals, it can be shaped only in this direction.

It is significant that there is at present a great drive towards experimentation in education. And some of the new methods of education that are being proposed and experimented upon at the forward centres of education all over the world seem to be leading straight to the right solution. The ideas of individual differentiation, the stress on multiple methods of teaching for different categories of students, recognition of the phenomena of genius, insistence on all-round development of the personality, and an ardent attempt at implementing the idea of freedom and that of consulting the child in his own education—all this has created a new atmosphere which augurs well for a new creation.

In the experiments in education at the Ashram .. an attempt has been made to give to all the new and significant ideas in education their full value and work out their extreme conclusions, so that in the final solution each truth of educational theory and practice may find its true place and complete fulfilment.

There has recently been in India a great deal of thinking on the problem of moral and religious or spiritual education. It has been strongly felt that even while "religious education" as such cannot be sponsored by the secular State, education in moral and spiritual values can and

should be made an integral part of the national system of education. There is also a serious inquiry as to the connotation of moral and spiritual values, and the methods by which these values can be inculcated among the students. The inquiry is far from complete and even serious doubts have been raised as to whether in the context of the present day educational environment, moral and spiritual education would at all be possible, or whether, even if attempted, it could be anything more than the teaching of moral and religious philosophy.

These doubts cannot be brushed aside, for what is very often suggested is not "religious education" or "spiritual education" or "moral education," but education *about* religion, spirituality or morality, and that too by means of a few standard and graded books, and in the environment of the classroom and school-benches. Even when better suggestions are being hazarded, they do not seem to lead us far into the heart of the solution of the problem.

A central research into this problem is therefore urgently needed.

The Ashram has, however, been engaged in research in this problem for the last several decades, and this research has been both practical and theoretical.

### *Psychic and Spiritual Education*

A basic distinction has to be made between morality, religion and spirituality...

Morality is that part of the ordinary life which seeks to regulate and guide the various physical, vital, mental or ideal pursuits by some definite principles determined by the rational thought or by some intuitive insight obtained at the level of the highest practical or pure reason. But the standards of conduct

erected by the moral consciousness, even the so-called universal principles of the categorical imperative, cannot be determined with certainty, and these in the present application by a bewildered and imperfect humanity come easily to be conflicting principles. Justice often demands what love abhors, and in fact man's absolute justice easily turns out to be in practice a sovereign injustice. Morality is always in a state of disequilibrium and thus the moral values cannot be credited with absoluteness.

Religion is an endeavour of man to turn away from the earth towards the Divine, but this seeking is still of the mind or of the lower ignorant consciousness, as yet without knowledge and led by the dogmatic tenets and rules of sect or creed which claims to have found the way out of the bounds of the earth-consciousness into some beatific Beyond. The religious life may be the first approach to the spiritual, but very often it is only a turning about in a round of rites, ceremonies and practices or set ideas and forms without any issue...

The truth is that neither morality nor religion represents the highest reach of man's consciousness. They may prepare, but they are not the resting-place, as stations on an evolutionary journey they can be accepted, but not as the destination. Both of them are a seeking. Morality is a seeking of a guiding principle of conduct, but this seeking is mental and, when it goes beyond, it no more remains morality. Religion is a seeking of the Divine, but the method of this seeking is that of dogma, ritual and ceremony, and an involvement in a fabric of moral, social and cultural institutions all determined and permeated wholly or partly by the dogmatic tenets and rules of the sect or

creed. It is an ignorant and a mental way of seeking. When it goes beyond and liberates itself from dogma, ritual, ceremony and rules, it ceases to be religion in the strict sense of the word. Beyond morality, beyond religion, is the path of Yoga, beyond the moral and the religious life is the spiritual life.

The spiritual life proceeds directly by a change of consciousness, a change from the ordinary consciousness, ignorant and separated from its true self and from God, to a greater consciousness in which one finds one's true being and comes first into *direct and living contact* and then into *union with the Divine*. For the spiritual seeker this *change of consciousness is the one thing he seeks and nothing else matters*. Both morality and religion in their deepest core touch spirituality and may prepare the change of consciousness, but the element of "spirituality" does not constitute the differentia by which we can define morality or religion. *Spirituality not only aims at the total change of consciousness, but even its method is that of a gradual and increasing change of consciousness*. In other words, spirituality is an exploration of consciousness through consciousness.

Spirituality and spiritual values and the methods of realising them are distinctive and must not be confused with either morality or religion and their methods. The method of spirituality is purely yogic, and nothing short of Yoga can bring about the realisation of the spiritual values.

A mere learning about Yoga is not Yoga, and even the most catholic book on Yoga cannot be a substitute for the direct yogic practice of an inner change of consciousness by which one can perceive and realise the inner and higher Self and transform the workings of the

outer instruments of nature. Nor can Yoga be practised in a casual way or only as a part-time preoccupation. Yoga to be properly practised must be taken as a sovereign and central occupation and must govern and permeate every aspect of life and its activity. Then alone can there be any promise of realisation of the spiritual values.

An education that aims at the inculcation of spiritual values and at the reconciliation of these values with the dynamic demands of life must also be as radical and uncompromising as Yoga itself. It would not do merely to prescribe a few graded books on morality or spirituality and to allot a certain fixed quantum of hours to the study of these books. Spirituality is a living process and spiritual or true education is a process of kindling lights which cannot be done except by the Light that can kindle. Again, spiritual values are central and supreme values and they must therefore govern and penetrate as such all the values and aspects of education.

In practical terms, this would mean the dynamic Presence and Influence of the Teacher or teachers who have unveiled the inner Light and who in their own consciousness comprehend the underlying spiritual truth and unity in the various branches of knowledge.

Moreover, life itself is the great teacher of life, and, therefore, unless spiritual values are the very atmosphere and life-breath of the educational environment, they cannot be truly or effectively brought home to the students.

These conditions can be realised only in the Ashram system which not only admits the young ones for their basic or higher education, but creates a spiritual life and atmosphere through an advanced training and research in spiritual values,

in which the students can actively participate, and, even in a real sense, can contribute to the spiritual progress of their teachers.

It is recognised that it is extremely difficult to fulfil these conditions; but it is equally true that there is no other way.

The role that the teacher has to play in this conception of education demands of him certain special qualities. The function of the teacher is to enable and to help the student to educate himself, to develop his own intellectual, moral, aesthetic and practical capacities and to grow freely as an organic being, not to be kneaded and pressured into form like an inert plastic material. The teacher must have complete self-control not only to the extent of showing no anger but to that of remaining absolutely quiet and undisturbed under all circumstances.

In the matter of self-confidence he must also have the sense of the relativity of his importance. Above all, the teacher must have the knowledge that he himself must progress if he wants his students to progress, must not remain satisfied with what he is or with what he needs.

He must know that all are equal spiritually and he must not merely exercise tolerance, but have a global comprehension and understanding.

He must not have any sense of essential superiority over his students nor preference nor attachment whatsoever for one or another.

Whatever subject he teaches, he should enter into the very heart of it, and in doing so, he must go beyond the level where thinking proceeds by words, and enter into a plane where thinking proceeds by pure conception and ideation; and finally, he must enter into the consciousness where knowledge is acquired and expressed through direct experience.

The teacher in fact must be a yogi in order to discharge his responsibilities. And the greatest Master is much less a Teacher than a Presence pouring the divine consciousness and its constituting light and power and purity and bliss into all who are receptive around him. He does not arrogate to himself Guruhood in a humanly vain and self-exalting spirit. In the words of Sri Aurobindo

His work, if he has one, is a trust from above, he himself a channel, a vessel or a representative. He is a man helping his brothers, a child leading children, a Light kindling other lights, an awakened Soul awakening souls, at highest a Power or presence of the Divine calling to him other powers of the Divine.

The pursuit of the spiritual values is in fact the pursuit and cultivation of the truths and powers of two overruling aspects of personality, viz. what we have called the psychic and spiritual.

The psychic being is the real individual, the real person behind all personalities, it is the integrating centre which, little by little, projects itself into the body, life and mind, in proportion to their right development, and suffuses them with its light and purity and establishes by its progressive governance a harmony of the different parts of the being...

While the psychic is the inmost and deepest being in us, the spiritual is the higher and transcendental. While the psychic life is the life immortal, endless time, limitless space, ever progressive change, unbroken continuity in the world of forms, the spiritual consciousness, on the other hand, means to live the infinite and the eternal, to throw oneself outside all creation, beyond time and space

And there is still an integrating supra-mental consciousness which reconciles the transcendental tendency of the spiritual and the immanent tendency of the psychic. *Some Practical Hints* A complete psychic and spiritual education is a life-long process, and yet, in so far as they truly give meaning to the life-development, they must determine the entire process of the education of the child and the youth. In fact, they must truly be the starting-point of all education. A few indications and ideas which would govern this programme of education are given below.

It may first be noted that a good many children are under the influence of the psychic presence which shows itself very distinctly at times in their spontaneous reactions and even in their words. All spontaneous turning to love, truth, beauty, knowledge, nobility, heroism, is a sure sign of the psychic influence.

To recognise these reactions and to encourage them wisely and with a psychic feeling would be the first indispensable step.

It is also important to note that to say good words, give wise advice to a child has very little effect, if one does not show by one's living example the truth of what one teaches. The best qualities to develop in children are sincerity, honesty, straightforwardness, courage, disinterestedness, unselfishness, patience, endurance, perseverance, peace, calm and self-control; and they are taught infinitely better by example than by beautiful speeches.

The role of the teacher is to put the child upon the right road to his own perfection and encourage him to follow it, watching, suggesting, helping, but not imposing or interfering. The best method of suggestion is by personal example, daily



conversation and the books read from day to day

These books should contain, for the younger student, the lofty examples of the past, given not as moral lessons but as things of supreme human interest, and for the elder student, the great thoughts of great souls, the passages of literature which set fire to the highest emotions and prompt the highest ideals and aspirations, the records of history and biography which exemplify the living of those great thoughts, noble emotions and aspiring ideals.

Opportunities should be given to the students, within a limited sphere, of embodying in action the deeper and nobler impulses which rise within them.

The undesirable impulses and habits should not be treated harshly. The child should not be scolded except with a definite purpose and only when indispensable. Particularly, care should be taken not to rebuke a child for a fault which one commits oneself. Children are very keen and clear-sighted observers; they soon find out the educator's weaknesses and note them without pity.

When a child makes a mistake, one must see that he confesses it to the teacher or the guardian spontaneously and frankly, and when he has confessed, he should be made to understand with kindness and affection what was wrong in the movement and that he should not repeat it. A fault confessed must be forgiven. The child should be encouraged to think of wrong impulses not as sins or offences but as symptoms of a curable disease, alterable by a steady and sustained effort of the will—falsehood being rejected and replaced by truth, fear by courage, selfishness by sacrifice and renunciation, malice by love.

A great care should be taken that

unformed virtues are not rejected as faults. The wildness and recklessness of many young natures are only the overflowings of an excessive strength, greatness and nobility. They should be purified, not discouraged.

An affection that sees clear, that is firm yet gentle and a sufficiently practical knowledge will create bonds of trust that are indispensable for the educator to make education of the child effective.

When the child asks a question, he should not be answered by saying that it is stupid or foolish, or that the answer will not be understood by him. Curiosity cannot be postponed, and an effort must be made to answer the question truthfully and in such a way as to make the answer accessible to the brain of the hearer.

The teacher should ensure that the child gradually begins to be aware of the psychological centre of his being, the psychic being, the seat within of the highest truth of our existence, that which can know and manifest this truth.

With this growing awareness, the child should be taught to concentrate on this presence and make it more and more a living fact.

The child should be taught that whenever there is an inner uneasiness, he should not pass it off and try to forget it, but should attend to it, and try to find out by an inner observation the cause of the uneasiness so that it can be removed by inner or other methods.

It should be emphasised that if one has a sincere and steady aspiration, a persistent and dynamic will, one is sure to meet in one way or another, externally by study and instruction, internally by concentration, revelation and experience, the help one needs to reach the goal. Only one thing is absolutely indispensable: the will to discover and realise. This discovery

and this realisation should be the primary occupation of the being, the pearl of great price which one should acquire at any cost. Whatever one does, whatever one's occupation and activity, the will to find the truth of one's being and to unite with it must always be living, always present behind all that one does and that one experiences, all that one thinks.

There are aspects of the mental, vital and physical development which contribute to the psychic and spiritual education. They can be briefly mentioned.

In its natural state the human mind is always limited in its vision, narrow in its understanding, rigid in its conceptions, and a certain effort is needed to enlarge it, make it supple and deep. Hence, it is very necessary to develop in the child the inclination and capacity to consider everything from as many points of view as possible. There is an exercise in this connection which gives greater suppleness and elevation to thought. It is as follows. A clearly formulated thesis is set, against it is opposed the antithesis, formulated with the same precision. Then by careful reflection the problem must be widened or transcended so that a synthesis is found which unites the two contraries in a larger, higher and more comprehensive idea.

Another exercise is to control the mind from judging things and people. For true knowledge belongs to a region much higher than that of the human mind, even beyond the region of pure ideas. The mind has got to be made silent and attentive in order to receive knowledge from above and manifest it.

Still another exercise: whenever there is a disagreement on any matter, as a decision to take, or an act to accomplish, one must not stick to one's own conception or point of view. On the contrary,

one must try to understand the other person's point of view, put oneself in his place and, instead of quarrelling or even fighting, find out a solution which can reasonably satisfy both parties; there is always one for men of goodwill.

And there are many such exercises.

A wide, subtle, rich, complex, attentive and quiet and silent mind is an asset not only for the psychic and spiritual discovery, but also for manifesting the psychic and spiritual truths and powers.

The vital being in us is the seat of impulses and desires, of enthusiasm and violence, of dynamic energy and desperate depression, of passions and revolt. The vital is a good worker, but most often it seeks its own satisfaction. If that is refused totally or even partially, it gets vexed, sulky and goes on strike.

An exercise at these moments is to remain quiet and refuse to act. For it is important to realise that at such times one does stupid things and in a few minutes can destroy or spoil what one has gained in months of regular effort, losing thus all the progress made.

Another exercise is to deal with the vital as one deals with a child in revolt, with patience and perseverance showing it the truth and light, endeavouring to convince it and awaken in it the good will which for a moment was veiled.

A wide and strong, calm but dynamic vital capable of right emotion, right decision, and right execution by force and energy, is an invaluable aid to the psychic and spiritual realisations.

The body by its nature is a docile and faithful instrument. But it is very often misused by the mind with its dogmas, its rigid and arbitrary principles, and by the vital with its passions, its excesses and dissipations. It is these which are the cause of the bodily fatigue, exhaustion

and disease. The body must therefore be free from the tyranny of the mind and of the vital and this can be done by training the body to feel and sense the psychic presence within and to learn to obey its governance. .

At a certain stage of development, when the seeking of the student is found to be maturing, he can be directed more and more centrally to the psychic and the spiritual discovery. And here we come to yoga proper, the nature and problems of which have to be studied separately.

### *Free Progress System*

An education governed by spiritual values stands in need of a very flexible structure of organisation. A brief description of the salient features of such a structure that is growing at the Ashram as a result of several experiments made there in this direction

The structure is oriented towards the meeting of the varied needs of the students, each one of whom has his own special problems of development.

It is not merely the 'subjects' of study that should count in education. The aspiration, the need for growth, experience of freedom, possibility of educating oneself, self-experimentation, discovery of the inner needs and their relation with the programme of studies, and the discovery of the aim of life and the art of life—these are much more important, and the structure of organisation must provide for them.

In this system, each student is free to study any subject he chooses at any given time, but this freedom has to be *guided*, the student should experience freedom, but it might be *misused*. The student has therefore to be watched with care, sympathy and wisdom. The teacher must be a friend and a guide, must not impose him-

self, but may intervene when necessary. The wastage of opportunities given should not be allowed indefinitely. But when to intervene depends upon the discretion of the teacher.

A great stress falls upon the individual work by the students. This individual work may be a result of the student's own wish to follow a particular topic of interest, or it may be a result of a suggestion from the teacher but accepted by the student. It may be of the nature of a follow-up of something explained by the teacher, or it may be of the nature of an original line of inquiry.

This "individual work" may be pursued in several different ways by

- a quiet reflection or meditation;
- referring to books or relevant portions of books suggested by the teacher,
- working on "work sheets" prepared for the students by the teachers;
- consultation or interviews with the teachers,
- carrying out experiments;
- solving problems,
- writing compositions;
- drawing, designing, painting, etc.
- any other work, such as decorating, cooking, carpentry, stitching, embroidery, etc.

There are topics in each subject where lectures are useful, and for these topics, lectures are organised, but these lecture classes are comparatively fewer than those obtained in the classical system. This necessitates the announcement of timetables every week.

There are also classes of discussions between teachers and students and between students and students. These discussion classes again are not compulsory. However, the discussions do not pertain

merely to academic subjects; they often centre round the individual needs of growth, and thus they provide an opportunity for guiding the students in their inner search.

In each subject, there are topics which more easily yield to the project system; teachers therefore announce a few projects in each subject, and students according to their choice select at least a minimum number of projects for which they collectively or individually work and produce charts, monographs, designs, etc which are periodically exhibited for the benefit of the whole school.

The role of the teacher in this system is

to aid the student in uncovering the inner will to grow and to progress—that should be the constant endeavour of the teacher,

to evolve a programme of education for each student in accordance with the felt needs of the student's growth, to watch the students with deep sympathy, understanding and patience, ready to intervene and guide as and when necessary, to stimulate the students with striking words, ideas, questions, stories, projects and programmes—that should be the main work of the teachers.

But to radiate inner calm and cheerful dynamism so as to create an atmosphere conducive to the development of higher faculties of inner knowledge and intuition—that may be regarded as the heart of the work of the teachers.

An adequate organisation of the above working of the Free Progress System would need the following

A Room or Rooms of Silence, to

which students who would like to do uninterrupted work or would like to reflect or meditate in silence can go as and when they like.

Rooms of Consultations, where students can meet their teachers and consult them on various points of their seeking;

Rooms of Collaboration, where students can work in collaboration with each other;

Lecture Rooms, where teachers can hold discussions with their students and where they can deliver lectures—short or long—according to the need.

The study of each subject can be so directed that it leads ultimately to the discovery of the fundamental truths underlying the subject. These fundamental truths form ultimately a unity, and at a higher stage a philosophical study of this unity would itself contribute to the deepening of the sense of Truths which directly helps in the maturity of the psychic and spiritual or yogic aspiration.

The sense of the unity of the truths would also contribute to the reconciliation of the various branches of Knowledge, thus leading to the harmony of Science, Philosophy, Technology and Fine Arts. In the spiritual or yogic vision, there is an automatic perception of this unity, and in the teaching of the various subjects the teacher can always direct the students to this unity.

The system of Free Progress Classes and the new vision of the unity of knowledge necessitate new types of textbooks and reference books. And here too, the teachers in the Ashram are engaged in the writing of such new books. This work is a most pioneering adventure in education, and it has involved teachers in a

long, difficult and arduous path of research

There are golden reaches of our consciousness, and from them and from the reaches intermediate between them and our ordinary mental consciousness there have descended forces and forms which have become embodied in literature, philosophy, science, music, dance, art, architecture, sculpture, in great and heroic deed and in all that is wonderful and precious in the different organised or as yet unorganised aspects of life. To put the students in contact with these, Eastern or Western, ancient or present, would be to provide them with the air and atmosphere in which they can breathe an inspiration to reach again to those peaks of consciousness and to create still newer forms and forces which would bring the golden day nearer.

The teachers and scholars at the Ashram are preoccupied with this work, and their research work in this direction is contained not only in their published or unpublished books, but also in the actual contents of their day-to-day work and lectures and in their organisations of exhibitions, of dance, drama, music, and numerous other educational activities. An adequate account of this work would fill a volume.

It is in the context of this vibrating and powerful process of the psychic and spiritual education that the activities of the physical, vital, and mental education are set and worked out at the Ashram. In each of these fields, again, there are specialists in the Ashram who are engaged in various activities of experimentation.

#### *Mental Education*

All the processes and methods of mental education can best be determined by the knowledge of the nature of the Mind. Mind, as we regard it, is primarily

a faculty of understanding all understanding, again, is a discovery of a centre round which the ideas or things in question are held together.

Mental education then is a process of training the mind of the student to arrive at such central conceptions round which the widest and the most complex and subtle ideas can be assimilated and integrated.

It is again found that even these central conceptions point still to a beyond, to their own essential Meaning, which can be glimpsed and conceived by the mind, but which cannot be held and possessed fully in experience by the mind. This point marks the climax of the mental development as also a clear sign of the limitations of the mind. Having reached there its office is to fall into a contemplation of silence and to open to the higher realms of experience, to receive clearly and precisely the intuitions and inspirations from those higher realms, and to give creative expression to them.

To train the mind on these lines, there are five phases of the programme:

Development of the power of concentration, the capacity of attention;

Development of the capacities of expansion, wideness, complexity and richness,

Organisation of ideas round a central idea or a higher ideal or a supremely luminous idea that will serve as a guide in life;

Thought control, rejection of undesirable thoughts so that one may, in the end, think only what one wants and when one wants,

Development of mental silence, perfect calm and a more and more total receptivity to inspirations coming from the higher regions of the being...

Multiplicity of ideas, richness of ideas, totality of points of view—these should grow by a developed power of observation and concentration and by a wideness of interests. Care should be taken to see that the central ideas are not imposed upon the growing mind—that would be the dogmatic method, which tends to atrophy the mind. The mind should grow towards the central ideas, they must come as a discovery of the mind, they must come as a result of a rigorous exercise of the speculative faculty.

A stress should fall not only upon understanding, but also upon criticism and control of ideas. Not only comprehension, synthesis and creativity, not only judgment, imagination, memory and observation, but also the critical functions of comparison, reasoning, deduction, inference and conclusion. Both the aspects of the human reason are essential to the completeness of the mental training.

One of the best methods is to create an atmosphere in which the massive and powerful ideas are constantly being thrown as a stimulation and a challenge impelling the students to arrive at them or strive to grasp and assimilate them.

Thinkers alone can produce thinkers; and unless the teachers are constantly in the process of building up great thoughts and ideas, it is futile to expect a sound or vigorous mental education.

An atmosphere, vibrant at once with ideation and silence, an atmosphere surcharged with a synthetic thought and a most integral aspiration, and an atmosphere filled with the widest realisation and a harmonious unity—such an atmosphere is an indispensable condition of the perfect mental education...

### *Vital Education*

Vital education aims at the training of

the life-force in three directions: to discover its real function and to replace its egoistic and ignorant tendency to be the master by a willingness and a capacity to serve higher principles of the psychological constitution; to subtilise and sublimate its sensitivity which expresses itself through sensuous and aesthetic activities; and to resolve and transcend the dualities and contradictions in the character constituted by the vital seekings, and to achieve the transformation of the character.

The usual methods of dealing with the vital have been those of coercion, suppression, abstinence and asceticism. But these methods do not give lasting results, and besides, they only help in drying up the drive and dynamism of the life-force, and thus the collaboration of the life-force in self-fulfilment is eliminated.

The right training of the vital then is much more subtle and much more difficult, needing endurance, endless persistence and an inflexible will. For what is to be aimed at is not the negation of life but the fulfilment of life by its transformation.

First, the powers of the senses have to be developed, subtilised and enriched. Next, there are inner and latent senses which are to be discovered and similarly developed. Third, the seekings of these senses have to be trained to reject grossness and coarseness and to enjoy the finer tastes and higher aesthesis. Finally, there has to be a deeper and piercing observation of the desires, passions, ambitions, lusts, etc., their usings, revolts and contradictions, and an attempt by various methods to separate out in each movement the elements contribute to the concord and harmony from those tending in the opposite direction, and to eliminate these latter from the very nature and fibre

of our psychological constitution.

The effective methods of this last aspect are

to instill in the child as soon as possible the will towards progress and perfection,  
 rational argument, sentiment and goodwill, or appeal to the sense of dignity and self-respect, according to the nature of the child in question,  
 to insist on the idea that the will can be developed, and that no defeat should be taken as final,  
 to demand from the will the maximum effort, for the will is strengthened by effort,  
 above all, the example of the educator shown constantly and sincerely

But still the direction in which the effort has to be made can be known only by the training of the mind and by the opening of the secret knowledge that is within us. To develop therefore in the vital the habit to open to this light and to act in that light would be to place the vital in its proper place as a will-force executing the inner and higher knowledge.

In the actual practice, the ideas on vital education can be implemented by

a special emphasis on the study of science in which sense-observation requires to be greatly cultivated and made very precise,  
 a great stress on audio-visual methods, taking, however, care to see that these aids do not become a bar to the children's own discovery of things and their aspects by their own observation;  
 a stress on the different kinds of fine arts and crafts,  
 an organisation of the activities in which the dynamic participation by

the students is encouraged so as to give them the opportunity to maximise their effort and the exercise of their will,

conditions in which what is valued most is not the result, but application and doing one's best,

conditions in which inner observation and introspection are encouraged, enabling the students to analyse the inner dualities and contradictions with a will to change and transform the character;

conditions in which the need for outer advice is minimum, and in which the work of chance of the students' character is sought by example, presence, influence and inner work on the part of the teachers

It is on these lines that the Ashram has organised its activities leading towards the perfection of the vital education

The life energy is channelised in disciplined and fruitful directions, the principle of assigning responsibility and leadership in different activities so as to develop courage and heroism is given its full value and practical application. Several of the Captains in the Physical Education Department are students, advanced students are given some responsible work or even teaching work at the Centre of Education. Besides, students are encouraged to develop the qualities of straightforwardness, uprightness, frankness and honour.

The child is expected and allowed to think for himself and act according to what he thinks best, advice is given where needed but nothing is imposed. Care is taken to provide a surrounding in which the child can feel that he is a responsible and free being for his self-expression and true-expression by which alone he can be

a harmonious part of the world

The students who show interest and talent in art, music, photography, crafts, etc., are given every facility to develop themselves in these directions. There is a provision for teaching music—vocal and instrumental (both Eastern and Western). Gifted artists are in charge of guiding the students in drawing and painting. There is also a provision for learning the Indian system of dance and Western Ballet. Similarly, there are arrangements for students to participate in works of applied science carried out by the various departments of the Ashram, such as printing press, cottage industries, tailoring, embroidery, paper manufacturing, farms, building service, workshops for automobile and metal work, bakery, dairy, laundry, medical establishments, etc. In addition, there is a technical course which students can take up along with their academic studies. Also, there is a Home Science and Nursing Course for those students who show interest in these fields. There is also a course in weaving.

Besides, throughout the year there are varied programmes of dramatics, dancing and vocal and instrumental music. Every Saturday, there is a programme largely arranged by the students under the guidance of the teachers which endeavours to meet the special needs for artistic and cultural expressions.

Exhibitions are organised throughout the year in which the maximum participation of the students is sought.

The activities in physical education are so designed that the students get the opportunity to develop the team spirit, the qualities of collaboration, friendliness to competitors, self-control, scrupulous observance of the laws of the game, fair play, and avoidance of the use of foul means, an equal acceptance of victory or

defeat without bad humour, a ready obedience to the command of the captain and a loyal acceptance of the decision of the referee. The competitions in the physical education are so conducted as to give the highest value to the maximum effort rather than to the results of the competitions.

### *Physical Education*

The physical is our base, and even the highest spiritual values, to be effective on the earth, must express themselves through the life that is embodied here. *Shriram khalu dharmasadhanam*, says the old Sanskrit adage—the body is the means of fulfilment of dharma, and dharma means every ideal which we can propose to ourselves and the law of its working out and its action.

Of all the domains of education, the physical is the one most completely governed by method, order, discipline, procedure. All education of the body must be rigorous, detailed and methodical.

The education of the body has three principal aspects:

control and discipline of functions; a total, methodical and harmonious development of all the parts and movements of the body; rectification of defects and deformities, if there are any.

The physical education must be based upon a knowledge of the human body, its structure and its functions. And the formation of the habits of the body must be in consonance with that knowledge.

The child should be taught right from the early stage the right position, postures and movements. A similar training should be with regard to the choice of food. The



child must develop the taste for food that is simple and healthy, substantial and appetising. He must avoid all that merely stuffs and causes heaviness, particularly he must be taught to eat according to his hunger and not make food an occasion to satisfy his greed and gluttony. The child should also be taught the taste for cleanliness and hygienic habits. It is important to impress upon the child that he is not more interesting by being ill; rather the contrary. Children should be taught that to be ill is a sign of failing and inferiority, not of a virtue or a sacrifice.

In the general programme of education for the children, sports and games should be given a fair place. At the Ashram, detailed experiments have been made in certain specific areas:

Comprehensive physical training versus specialised physical training,  
Can men and women have the same programme of physical education?

The integration of the Indian and the Western systems of physical education, and

Physical education as an integral part of spiritual perfection

The results of these experiments have appeared continuously in the *Bulletin of Sri Aurobindo International Centre of Education*, which is our official organ since the year 1949.

The Ashram has organised a well-knit association, called J.S.A.S.A. (Jeunesse Sportive de l'Ashram de Sri Aurobindo). To this Association are admitted students from the age of 6 onwards and there are members of this Association who are over the age of 75. For, it is understood that it is never too soon to begin nor too late to continue. All the members are divided into several groups according to age, and

for each group, there is a time-table suited to that age-group. Normally, students are required to allot nearly two hours daily to physical education throughout the whole year. (There is no vacation.) The programme of physical training is carefully organised: it consists of athletics, gymnastics, aquatics, combatives and Indian and Western games. Every student, instead of specialising in one or two items, participates in all the aspects of physical education, the lack in high specialisation is more than compensated by the wide and synthetic training of all the parts and aspects of the body. But still there is also a provision for specialisation at a higher stage, for those who would choose specialisation.

An attempt is made to integrate the truths of the Hatha Yoga with the principles underlying the Western system of exercises. It is noted that the awakening of the Kundalini which is one of the results of the Hatha Yogic Asanas can very well be accomplished by the Western system as well.

The women have more or less the same programme of physical education as men. It is our conclusion that it is a mere prejudice to stress too much on a different programme of physical education for women.

The year is divided into four seasons, and at the end of each one, there are competitions and tournaments in the various items of physical education. A complete record of the results is maintained, and there is a comparative study of these results with the international standards and achievements in the respective fields.

Facilities for carrying out the programme of physical education are numerous: a stadium with a 400 metre cinder track with provision for field events, grounds for football and cricket, and a

swimming pool of 33 1/3 metres built to Olympic specifications with an attached pool for children and a large gallery for spectators. Besides, there are two tennis courts, two grounds for basketball and volleyball, a pit for Indian wrestling, a ring for boxing and a dojo for Japanese Judo, a large courtyard and a gymnasium with the most modern equipment.

Individual attention is paid to each member and steps are taken to inculcate an aspiration in the youngsters to have not only a healthy body but also a form of grace, symmetry and beauty. Members are encouraged to make the body increasingly supple and responsive.

Nourishment of the children is given prime importance. Good, healthy and nutritious food is provided to the children and the physical education provided to

them ensures good health. Besides, there is a periodical health examination and dental check-up conducted by efficient doctors. Those who need to follow up a treatment are given careful attention. The massage clinic helps the injured and those who specially need its service to relieve them of pain and stiffness which some people experience after their course of training. There is also an X-Ray department attached to the Medical Section. A system of body measurements with posture photographs and tests is also conducted to help the children know how they are growing and to see if the development is in the line of good proportion and harmony. Special exercises are given to those who need them in order to bring harmony and proportion and to correct defective formation and bad posture. □

# Educational News

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## PM on the purpose of education

"OUR educational institutions have largely been fashioned—perhaps wholly fashioned—to impart knowledge which soon becomes obsolete" Thus observed Smt. Indira Gandhi, Prime Minister of India, while inaugurating the Vice-Chancellors' Conference on 30 September 1975. She said, "education as we know and as the ancients have said—and I think it is a truth that will be true for all times—is not just knowing but is a becoming. And this is what we should try and achieve in our institutions. We must teach the human being to be a whole person, not divided into compartments, but a person whose entire personality develops in harmony...a whole-minded and indefatigable labour for the nation and for humanity" In that, "education is a training of all one's faculties to absorb, adapt, and to create. It should guide one towards maturity which means the willing acceptance of responsibility, inculcate the spirit of cooperation and helping of others, the feeling involved in programmes which are of national importance..." It is "something that is concerned

with every area of our life and our growth".

"Some of the problems which we face are due to the structure of education in this country, to the system which we have inherited and which we have continued with some patch-work with small changes here and there. Many of our young people flock to colleges not because of any love of knowledge or learning, not because of any aptitude, but because they cannot think of anything else to do and also because it has become something of a status symbol" Then on the problem of increasing numbers, the PM added, "Some reduction is essential, but it should be brought about in a way that the weaker classes do not feel that the door is shut against them. We must have special programmes necessary to enable the backward class students to catch up. Our education system does favour the better-off and neglects the poor. How do we change this and give the widest opportunity to those who have been so long denied it? I welcome the emphasis laid on non-formal education, on enabling

youths and all the people to educate themselves and obtain degrees, if necessary through correspondence courses"

On the role of mass media for education, the Prime Minister believed "We have also to think of new methods and the role of radio and television, in education. When we brought in television and expanded radio programmes, the idea was not at all that it should only provide a certain type of entertainment to city people. The idea was certainly that there should be entertainment which is an important part of life and recreation but that the programmes taken as a whole should be educative for all sections of the people without being boring. But we have gone away from that and radio and TV are in a separate drawer, education is in a separate drawer, health programmes are in a third drawer. Now, all these things are interlinked, agriculture and so on, we must learn to think that education of all these together is one composite picture and not something that is divorced from life". For this, the SITE programme has to be "much more education-oriented—education in the wider sense of the word. It should be education of the kind that helps us to have a better understanding of rural problems and gives the rural public a better understanding of what they need for greater production, better health and a better understanding of the rest of the world".

### **The expanding schooling facilities in India**

THE EXPANSION of secondary schools in the rural area during the period 1965-73 was unusual: it was nearly 67 per cent against 44 per cent in the case of their

urban counterpart and against the total of 57.86 per cent at this stage. But at the primary and middle levels, the urban areas surpassed the rural ones in expanding the schooling facilities. The primary level experienced an overall increase of 18.95 per cent and the middle 13 per cent, with about 32 per cent and 16.93 per cent increase in urban schools, and 17.76 per cent and 12.58 per cent in rural schools respectively. Nevertheless, Andhra Pradesh recorded a decrease of 0.34 per cent primary schools while Goa, Daman and Diu 40 per cent in the case of urban primary schools. However, taking the entire school level, there has been an overall increase of 20.18 per cent, 31.22 per cent in urban and 18.81 per cent in rural areas. In December 1973, the country had 592,088 schools, of which 520,728 are situated in the rural areas. Likewise, of the total 461,864 primary schools, 419,651 are located in rural areas, and in the case of secondary, this proportion is 42,522 : 27,233 and at the middle 87,702.73,844

Another outstanding revelation is that the percentage increase in enrolment in the case of girls has been far more than that of boys at all stages of schools during this period of 8 years: the highest being in Class IX onwards—it is 79.51 per cent as against 39.31 per cent in the case of boys at this level; at middle stage it is 62.28 per cent against 33.39 for boys; and at primary 28.94 per cent as against 21.18 for boys. Besides, there has been a marginal increase in the ratios of enrolment of child population in the corresponding age groups, particularly at primary and middle levels, for which the third All India Educational Survey has provided provisional statistics as also for other facts stated here. Gross enrolment ratio for the age group 6-10

years increased from 74.36 per cent in 1965 to 79.16 in 1973; while for the age group 11-13 the increase was from 30.15 per cent to 34.72. Similarly, there has been a slight increase in the percentage of girls' enrolment to the total enrolment over these years, for the primary it increased from 36.19 to 37.64, at middle from 26.57 to 30.85, and at secondary from 22.35 to 27.06.

The primary school enrolment through Classes I to V reveals a downward trend. With 100 students in Class I, their enrolment in Class II falls down to 66.11, in Class III to 52.36, in Class IV to 40.04 and in Class V to 31.80 only. The total number of children studying in Class I was found to be 20,889,063 (8,268,889 girls), in Class II, 13,810,450 (5,272,128 girls), in Class III, 10,937,066 (4,056,071 girls), in Class IV, 8,362,970 (3,026,959 girls), and in Class V, 6,642,444 (2,201,596 girls).

As to the provision of teachers, schools in our country have 2,603,458 (2,591,392 full-time and 12,066 part-time) teachers, with a shortage of 29,014. However, during this period of educational expansion, there has been a substantial increase in the number of teachers since 1965. The overall increase here is 35.42 per cent. The pupil-teacher ratio for the country is recorded as 1.32, though varying between 1.18 to 1.37 from State to State.

### **Social classes condition linguistic communication**

D R. CRAIG's doctoral thesis accepted at the London University, Institute of Education, 'studies the use of language by seven-year old Jamaican children in contrasting socio-economic environments'.

The study establishes that school language programme can be structured to focus precisely on one or more of the aspects: purposes, content or communication formats, depending on the goals of education and the specific needs of differently conditioned children.

Among the general conclusions drawn by this study, it is important that socio-cultural conditioning has an influence on the habitual purposes for which children use language and the kind of content that comes up for treatment in language. In that children from the lower social class use a language system and socio-cultural norms significantly different from that used by their upper class counterparts. These differences pertain to the point of lexicification in language development, the use of basic formats, internal processing, verbal vocabulary, the use of adjectives, the use of sentences in relation to quantity of words and the use of words per unit of time for the expression of a common set of basic meanings.

The general hypotheses were based on empirical evidence that since the majority of the Jamaican population especially in the lower socio-economic sector speaks what is commonly referred to as the dialect and what linguists refer to in its most extreme form as Jamaican Creole (JC) and since there is a wide range of variation existing between JC and the varieties of English that are spoken predominantly in upper social class situations, the children from lower class backgrounds differ from their upper class counterparts, firstly, by the use of significantly different language system and secondly, by having a different set of socio-cultural norms.

The study revealed that on morpho-syntactic characteristics of speech the

lower social group children, both urban and rural, were using a JC system with its peculiarities of sentence structure, different conventions relating to tense marking, inflections, pronominal systems and so on as compared with English. Also in the purposes of language use, the lower groups were more disposed than the upper groups to find pragmatic purposes, socio-centric sentences occurred most frequently in their case. The influence of socio-cultural environment was strongly evident in the content of language used, the lower groups had the most frequent reference to adults and adult behaviour, the urban groups (upper and partly lower) to mass media, fictional topics and characteristics. The content differences were described in terms of detailed lexical sub-categories according to the syntactic and selectional criteria. However, certain categories of language content such as references to place, time, number and quantity, modalities and logical relationships that seem relevant to cognitive abilities of a general sort did not differentiate absolutely between socio-cultural groups but differentiate in terms of the detailed alternatives. For instance, the total references to place and time were about equal for all children but the lower groups references conformed to previous indications by being more immediate and face to face than upper group references in the same broad content categories. Besides, as regards the formats of communication, the lower group children tended to lexify or give a morpho-phonological form to language elements earlier than their upper group counterparts.

### **The alternate-day schools**

HUSNI AYESH, Director of the Unesco-

UNWRA Teacher Training college of Amman in an article entitled "Reallocating School Time in Third World Schools" (*Prospects*, No. 2, 1975) advocates the division of the year into two school years, and the children into two groups who study concurrently and alternatively, one group going to school every other day, with the seventh day as the weekend. The long summer vacation, a vestige of an agricultural society, is questionable in its efficiency and hard to justify, a system of alternate days with two or three weeks of vacation in a convenient part of the year should be just as efficient, even from this particular point of view.

Since some or much of the curriculum of the present school being usually of a repetitive, additive or accumulative nature of knowledge in the different cycles of education, it pays little attention to the qualitative aspect of learning and child development. The alternate school system could be utilized to cope with both the quantitative and qualitative aspects of learning and development. In the days-off-school children can find time to examine the world around them and to do the homework, but in a manner which expands and enriches their experience, skills and values. They could imbibe independent study as a way of life, with more retention or learning and less teaching. In off-school days, they could be absorbed by the economy. If the economic system is prospering they could participate partially in the labour force and certainly can increase the country's production. And if the economic system is developing or underdeveloped, they could be utilized in public services according to a prescribed programme.

The new school could bridge the gap that now exists between the formal school

and the society. Systems oriented to memorization were acceptable when the school was the main source of knowledge and information. This arrangement is difficult to justify when knowledge and communication, or the so-called 'parallel school' today, play an increasingly important part in learning. In order to learn in a formal setting, the child must go to it. The 'parallel school' is all around the child. Some scholars claim that even most of what the children learn, that is of use to them, is learnt outside the school system. The proposed arrangement gives an excellent chance to integrate or link constructively the formal school with the parallel one. In addition, it means lower costs in many aspects and for many reasons a fewer number of schools and even of teachers are needed, without closing the door to more children.

### **Cheaper plastic schools**

A PROTOTYPE primary school made entirely of plastic has been erected in a Bangladesh village, named East Khulgaon, according to *Unesco Features*. Strengthened by incorporating local jute, the plastic school can stand the risk of cyclones and storms. This innovative structure, developed jointly by a Dacca Unit of the Co-operative for American Relief Everywhere and a Unesco team of specialists replaces a brick school destroyed by a violent cyclone in 1970. Another 40 plastic schools will be erected in the coastal villages soon, with the U.S. financial aid. This unusual school offers numerous advantages, particularly for the developing countries. It costs little, between 11 to 25%, less than the cost of brick structures, and is easily constructed and virtually maintenance free.

The East Khulgaon Plastic School measures 77 feet by 20 feet and accommodates 150 children in airy and bright conditions. Flexibility is a key feature of the design. Fewer modules make smaller school, addition of more modules make a bigger one. Two roof panels and two wall panels joined together make a module, which looks like a great inverted U, 21 modules linked together make the East Khulgaon School house. Division into classroom areas is done with partitions which could be shifted according to need and the absence of interior walls assures the most efficient use of space.

The credit for this invention, motivated by the necessities of Bangladesh as a coastal area, goes primarily to an English architect, David J. Vickery who heads the Educational Facilities Development Service at the Bangkok, UNESCO Regional Office for Education in Asia and William F. Woudenberg who is an imaginative plastic engineer from Prospect Street, New Jersey and heads CARE's Plastic Workshop. This plastic construction is applicable not only for schools but for other structures as well.

### **Reduced instructional time**

CENTRE for Educational Innovation and Technology, Saigon, is trying a 'Reduced Instructional Time' Project to achieve bipolar objectives of providing primary education opportunities for a larger number of children by re-designing the instructional process to both increase the learning rates of children and by reducing unnecessary classroom teaching in the traditional manner. The project is underway in both urban and rural schools in Vietnam and in order to attain complete revision in schooling it is divided into

the following four phases

*Phase 1* is designed to try out a variety of approaches on short (1-2 hours) segments of the primary curriculum. Twenty different types of learning have been identified in the curriculum for Grades I through V. For each of these segments, the research staff "brainstorms" to achieve a large number of creative ways in which the material can be learned most effectively and efficiently while reducing the amount of teacher-time. Following this, the staff identifies two to four of the approaches (or combinations thereof) with the greatest potential for reducing instructional time while maintaining learning effectiveness. These approaches are then "fleshed out" as instructional sequences to be tried out on a small scale in order to learn which approach is most appropriate for a given type of learning.

*Phase 2* involves a large-scale experimental programme based on the results of tryouts. A single 'best' approach for each of the 20 types of learning at the several grade levels will be developed as instructional materials and procedures for a five-hour segment of learning. When applied to real school situations the results of the several approaches will be compared with the results being obtained in the conventional school settings. The three general criteria to be used in this comparison are: (i) student achievement (effectiveness); (ii) student time to reach criterion achievement (learning rate); and (iii) the amount of time that teachers must be involved in the learning process (teacher-time).

*Phase 3* requires the efforts of 24 professionals for two years to develop all learning materials and procedures for the five-year primary curriculum. Tentatively, seven different approaches have been

tried on pilot scale in history and science subjects of Grade IV which reveal that overall learning time was reduced by as much as 50 per cent and student achievement levels approximately doubled.

*Phase 4* involves implementation, demonstration and revision of the learning process on the basis of two years' work in the pilot phase.

### *Approaches*

Examples of the variety of approaches currently being developed for tryouts in different subjects are given below.

### SOCIAL SCIENCE

In Grade IV, learning segment covering the Le Dynasty (1418-1527) three approaches have been tried out:

- (a) *Teaching Script* The teacher reads the lesson out loud and the students read along silently. They read the purpose of the lesson, the summary, the questions to be answered, the lesson and then try to answer the questions. The students use flip cards for home work.
- (b) *Programmed Instruction*. This is a self-instructional programme in which the students read question to small units of the lesson, answers the questions, check and if necessary, correct, the answers and then take a post-test.
- (c) *Comic Book* This is in the same format as the programmed instruction approach except that cartoons are used to illustrate the lessons.

In Grade V, learning segment on the French Occupation (1859-1883), four approaches are envisaged;



- (a) *Time Line.* The students are given a partially completed time line and partially completed summary chart. They read the story and fill in the missing parts of the time line and summary chart.
- (b) *Text plus Questions.* The students read the text, answer questions and then check their answers.
- (c) *Linear Programme.* The students work on a linear programme which uses both cueing and fading. They check their own answers and correct any errors they make.
- (d) *Students' Questions.* The students write their own questions and answers to the lesson in the text. They then break up into small groups and have a contest in which they can earn points for correctly answering their own and each other's questions.

#### ARITHMETIC

The following three approaches will be tried out in Grade II for learning linear measurement:

- (a) *Teacher-directed Practice.* The teacher explains the purpose of the lesson, demonstrates actual measurement with a meter stick as well as estimating various lengths and then supervises the students as they measure and estimate various items in the room.
- (b) *Student-directed Practice.* Student leaders work with about 10 students each and explain the lesson, demonstrate measurement and estimation, and supervise the students as they practice measurement and estimations.
- (c) *Linear Programme.* Cueing and fading are used in a self-instructional

linear programme. The students fill in the missing information, check and if needed, correct their answer.

#### GENERAL SCIENCE

The following three approaches could be tried out in Grade III for learning anatomy and uses of plant stems:

- (a) *Illustrated Linear Programme.* Pictures of various types of stems, their parts and some of their uses are presented. The students answer questions associated with the pictures and check their own answers.
- (b) *Flip Cards.* Flip cards are used, which have questions sometimes with pictures on one side and answers on the other side. Students work in pairs, one answering the questions and one providing feedback.
- (c) *Answer Hunting.* Students are given questions and suggestions for finding the answers. They have to find the answers in a library or by investigating stems in various places.

In Grade IV, four approaches will be applied to the learning of transformation, e. g. water to steam.

- (a) *Teacher-directed Linear Programme.* The teacher reads out the programme loudly and the students respond loud as a group. They check their answers and repeat the correct response.
- (b) *Self-instructional Programme.* The students use the same programme as in the linear programme but work through it by themselves.

- (c) *Teacher-directed Comic Book* The teacher asks questions about each illustration and all the students give the answers loudly.
- (d) *Self-Instructional Comic Book* Illustrations of various experiments are presented along with questions. The students answer the questions and check their own answers.

#### LANGUAGE

Three approaches will be tried out in Grade I for reading, comprehension and oral reading

- (a) *Peer Programmed Teaching* One student leader teaches approximately 10 students. The student explains the purpose of the lesson. The student-teacher operates a tape which presents oral reading exercises. The students repeat the exercises as a group as well as individual. The student-teacher tells the students when they are correct and gives them the right responses when they are wrong.
- (b) *Self-Instructional Programme* Small portions of a story are presented sometimes with illustrations. They are followed by questions. The students answer them and then check their own answers.
- (c) *Flip Cards*. Small portions of a story are written on one side of a card plus some comprehension questions. The answers are on the back. Each student goes through the cards that he initially got wrong. The objective is to go through all the cards without making any errors.

#### Nurturing the gifted

THE World Conference on Gifted Children held at the Royal College of Surgeons, London, in September 1975, considered, *inter alia*, various schemes operative in India in the matter of identification and encouragement of the talented school children. Dr. K. N. Saxena's paper discussed the importance of spotting the gifted at an early age with a view to helping them develop their potentialities to the maximum. It described in brief schemes like National Science Talent Search sponsored by the NCERT, National Rural Talent Search, Sports Talent Search and other scholarship schemes sponsored or financed by the Ministry of Education and Social Welfare or by other agencies at national, state and local levels.

#### An educational monthly attains school-going age

THE commencement of the 70's provided day light for a new educational monthly *The Educational Reporter*, being published under the editorship of Kumari Madhu Bala, from 159, Golf Links, New Delhi. During six years of its publication, it has earned a reputation of being a first-rate educational news reporter, with a certified circulation of 4000, both in India and abroad. It is on the approved list of many state governments and on the shelves of many school and college libraries. Besides the editor, the credit for its brilliant success goes also to a group of educational writers and journalists who conceived the idea of such a magazine purely as a missionary venture. Its annual subscription is Rs. 20.00.

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## DEPARTMENTAL NEWS

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### Department of Education in Social Sciences and Humanities

EVER since the inception of NCERT, this Department has been engaged in the development of instructional materials and methods for teaching Hindi as mother tongue at various school stages, teaching Hindi and Bengali as second languages, and teaching Sanskrit as a classical language. Besides, there is a programme of linguistics research, both applied and fundamental. The Department has the Central Language Laboratory where audio materials are developed for the teaching of English and Indian languages. Short-term orientation programmes for teachers and other key persons are organised by the Department to acquaint the teachers with the latest thinking in the field of applied linguistics and language teaching and also to train them in the utilization of materials and methods developed by the Department.

The Department has so far developed a variety of instructional material including curriculum and syllabus for the teaching of Hindi as the first and second language, Bengali as the second language, Sanskrit as the classical language and English as the first and second language.

Besides the instructional material, the Department has completed the following research projects.

1. The expected levels of attainments of children in mother tongue at primary, middle and secondary stages
2. Position of languages in school curriculum in India
3. A graphemic analysis of the Deva-

Nagiri script as used for reading and writing Hindi

4. A linguistic analysis and description of the phonological variations in standard Hindi.
5. Useful vocabulary of Hindi for Primary, middle and secondary school students.

The following are the on-going research projects

1. Fundamental research on language, thought and communication
2. Developing an educational vocabulary in Hindi
3. Contrastive study of Hindi vis-a-vis other Indian Languages (Gujarati)
4. Problems of teaching spoken Hindi to Malayalam speaking children.
5. Problems of teaching spoken Bengali to Hindi speaking children

It organises every year a summer institute in applied linguistics and language teaching with special reference to Hindi, both at basic and advanced level

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## FROM THE FIELD UNITS

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### Ahmedabad

THE Gujarat Cabinet has taken a decision that from July 1976 a new SSC pattern will be implemented. According to Shri Navalbhai Shah, Education Minister of Gujarat, the responsibility to take public examination at the end of Class X has been entrusted to the SSC Board. To begin with, 200 high schools in the State will start Class XI under the new scheme. The Minister assured that

as a result of the introduction of the new pattern, no teacher of high school will be retrenched. To replace the pre-university class in the colleges, Class XII will be started there. Later on, however, even this class may go to school. It has also been decided that out of the candidates who pass the new SSC examination, about 50 per cent will be diverted to the vocationalized stream. Those with good division will be allowed to go to the colleges and the universities including medical and engineering colleges and for the rest of them it may be considered as a terminal stage. They may go for the lower-grade jobs. The new SSC examination has been equivalent to the old SSC examination for clerical jobs.

The new pattern of education has been welcomed by the Federation of the Principals and the managements of the secondary schools of Ahmedabad. About two lakh students will take the new SSC examination and a lakh and a half the old SSC examination. Candidates of both the categories will be eligible for employment.

## Madras

### *Extension Service Centres*

THE Government of Tamil Nadu has informed the Extension Service Centres that the State finance will not be available to them after 31 March 1975. The services of the Coordinator and the staff of these centres, except in two, have been either retrenched or transferred to their substantive posts. In two of the centres which are in private colleges, the staff continue to work and some extension programmes have also been conducted by them. The management of these institutions continue financing them out of their own funds. On representation, the special

Secretary for Education has agreed to reconsider the issue of the continuance of these centres after evolving a pattern of work in collaboration with the State Institute of Education which is entrusted with the in-service training programmes.

### *Orientation Programme*

An analysis of the result of the High School Public Examinations of March 1975 has revealed a uniformly poor performance in all the schools managed by the Corporation of Madras. With a view to improving the result of these schools, a 15-day orientation programme for all the teachers of the final-year classes of 34 Corporation High Schools was conducted. Subject specialists from the colleges as well as from reputed schools, State Institute of Education and the Field Adviser, NCERT, worked as resource persons. Besides analysis of the content and clarification of concepts therein, the participants were given training in preparing good lesson plans and good questions. Details, such as diagnoses of the weaknesses of pupils and provision of suitable remedial instruction, were worked out in the course. Significant improvement in the performance of the pupils in the public examinations of March 1976 is expected.

### *Upgraded Curricula for all Schools*

Upgraded curricula in science and mathematics which were tried out in the pilot project schools have been introduced in all the schools in the State. The syllabi in physics, chemistry, mathematics, and biology of Class IX have been revised. The revised textbooks have been prepared and printed by the Tamil Nadu Textbook Corporation. The State Department of Education organised a series of in-service training programmes

for the teachers at the rate of one teacher for each subject from every school in the state. All the science kits received from the NCERT (under UNICEF-aided Science Project) have been distributed to the schools. The managements of other schools have also been helped to procure the equipment under a phased programme of giving grants from the State Government.

southern states. The following reports were presented and discussed.

1. Functional Literacy
2. Out-of-school Education for Girls
3. Vocational Education for Women
4. Education on Maternal Welfare
5. Physical Education.

### *Non-formal Education*

The Field Adviser collaborated with the State department of education in organising a two-day conference on non-formal education for women at the Lady Wellington Training College from 24 to 25 September 1975. The conference was attended by delegates from all the four

The conference was inaugurated by Dr V. R. Nedunchezian, Minister for Education and Tourism, Government of Tamil Nadu, and presided by Dr Smt R. Visalakshmi Nedunchezian, Chairman, Seminar Committee. Dr Malcolm S. Adiseshia, Vice-Chancellor, University of Madras, released a report on Non-Formal Education in Tamil Nadu. □

# Readers' Forum

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## HISTORY SYLLABUS

I READ with interest the draft approach paper on the curriculum of history at the school level (*JIE*, September, 1975) for the new 10-year High School Course

Instead of dividing Indian History into three periods to be taught in Classes VI, VII and VIII (Ancient, Medieval and Modern India, respectively), the following changes are suggested in the syllabus:

1. Certain important portions from all the three periods be included for all the three classes, so that the pupil is kept in touch with the important events of all the periods throughout. It usually happens that a child forgets the history he learnt in Class VI, when he reaches Class VIII. This difficulty can be obviated by parallel study of all the three periods.

2. I also suggest a new approach in preparing the syllabus and textbooks in history, which is "teaching history backwards": The teaching of modern or

recent history is followed by the teaching of medieval and ancient history. The children become more familiar with recent events and they find it easy to understand how the present is based on the past. As we trace the current events and causes backward, history becomes meaningful and interesting to children. This will help the pupils develop a sense of chronology.

### *Parallel Study of the Periods*

Since the 10-year High School course imparts general education, the history syllabus is to be necessarily based on 'patch approach', keeping in view the age of the pupils. For Class VI a few main 'patches' from the modern, medieval and ancient periods may be included, and later, the topics may be enlarged and a few new topics may be introduced in Class VII. In Class VIII the study of history should be more in depth and extent.

### *Teaching History Backwards*

It is a real problem for the teachers of history to make the subject meaningful and interesting. There is a tendency among pupils (sometimes among educated adults also) to look upon history as a dry-as-dust subject, something about the dead and gone. This attitude is mainly due to a lack of appreciation of the uses of history 'here and now'. The pupils should be convinced that the study of history is essential for a meaningful understanding of the present and a better ordering of the future. This can be achieved by teaching history backwards. If the teaching of history proceeds from the present to the past (from modern to medieval and ancient) it is like unfolding a mystery, a

seeking of causes and explanations for the present day happenings and problems.

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*We appreciate Shri S Kalidas's concern for the teaching of history at schools. But it may be noted here that teaching history backward has long been a subject of discussion among the educationalists, teacher-educators and curricula-makers*

*Besides, in the JIE, November 1975, Mr James L Henderson made a pointed reference to this in his article "Innovations in History Teaching"*

—EDITOR

# Book Reviews

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## Education and Economic Growth in India

S. C. Goel, Macmillan Co of India Ltd.,  
Delhi, 1975. pp 158  
Price Rs. 45 00

SINCE the importance of a good educational system for growth (besides many other ends) is hardly ever denied, an exercise to set up the proposition afresh would amount to pushing open many doors. Hence scholarship has to move away from establishing a qualitative relationship of this kind to precise quantification of the contribution made by education (or, should one say, the educated) to economic growth.

That quantification of this kind is based on a large number of assumptions, simplifications, exclusions and value judgements is not denied by any of the protagonists of such grandiose exercises. It would also then follow that such quantifications yield some sort of notional ideas about the relations involved. The point then is: what is achieved by such crude and gross quantification which a clearer analysis of various qualitative relations and approximate empirical evidence (for instance, in the form of behaviour pattern of chosen indicators) cannot yield. Even a taxonomic exercise, which may additionally arrange

the various variables in a hierarchical order, concerning the various feedback relationships between education (disaggregated into its components) and various socio-economic indicators can be of enormous help in clarifying policy alternatives. It may also enable the analyst to project the short - and long-run trends in the society through education.

It is true that clarifications of policy alternatives is not the same thing as unequivocal guidance in policy-making. That is to say, a qualitative analysis enables one to see the broad nature and direction of the consequences of various policy measures and interventions. The pattern out of which choices are to be made may not always be clear. In fact, more often than not, the policy outcomes would lie in the twilight zone and choice will involve a fairly good deal of reliance on hunches, judgments and prejudices. It is argued that the modern complex social phenomena impose a unique kind of urgency on the attainment of certain desirable outcomes. A policy-choice which is based on both *a priori* and empirical analyses of a qualitative variety which makes uncertain predictions only about the achievement/non-achievement and/or extent of achievement disregards the compulsive socio-political logic, neces-



sitating collective action. An efficient result-oriented system cannot be built up on the basis of action on an uncertain terrain. For such ends, one must know and know quite precisely. A policy-choice, then, should not only indicate the trends and the direction, it must clinch the issue with accuracy.

The long-standing, widely-voiced and generally acknowledged dissatisfaction with the performance of the educational system has given birth to analytical predilections which have a strong penchant for quantification. The same old bug of precise knowledge as a precondition of efficient policy operations has bitten the educational planners. The pity is that such educational statistical exercises, the greenfield of quantifiers, because they proceed in terms of demand, supply, output, rates, of return, etc., have come to pass as "economics of education."

The scrutiny to which education has been subjected, the alarm to which such exercises have given rise to, at least in the sense of their sheer frequency, are not, one suspects, unrelated to the fact that education concerns and is concerned with the most vocal sections of the society. Then, going by the evidence of the quantifiers, widespread dissatisfaction with education notwithstanding, Indian education in 1970-71 contributed 16.19 per cent of the net national product (p. 20). Since we have been spending around 3 per cent of our national income on education (p. 35, Table II.6), the returns are by any standards impressive, even if the figure of 16.19 is, on various methodological grounds, scaled down to 10.8 per cent (p. 20) as the author of the book under review seems to be doing. On macro-economic grounds, much of the criticism of our education, on this evidence, will seem to be either misinformed

or misdirected!

From the whole array of "quantitative results" the reviewer has picked up this basic result in order to highlight the non-specificity and policy-wise "non-fruit-bearing" nature of such exercises. If the relationship between the contribution made by education to NNP and the spending out of NNP on education is as impressive as it is found out to be by the author, one cannot see much reason for any basic unhappiness with education as it is going on in India. But coming to individual aspects of education *seriatim*, one has to go on wild goose chase in order to find its defenders! This paradox points to the basic question with which one started: the rationale and utility of quantification of various relations involved in the process of *understanding* the performance of an educational system.

The clarification of policy issues, and availability of informational basis which can conclusively demonstrate the validity of the choices made are supposed to be the great points in favour of quantification of relationships in the field of education. We have seen that even after quantification, unequivocal guidance may preclude, not only because of uncertainties etc. (of which a proper sensitivity analysis can take operationally relevant care) but because of persistence of *directional* confusion.

But more important still is the fact that the process of arriving at quantified formulations necessitates both a number of theoretical, qualitative proposition, lacking the lustre of quantified values and a number of value judgments in order to choose the numerical values. That is to say, we arrive at impressive, precise quantitative values on the basis of non-quantified theoretical relations and prior

choice of some other numerical figures on the basis of judgments which are without 'objective' basis. A value which is a product of earlier arbitrary choice of some other numerical values can scarcely be more 'objective' than its computational base.

Many examples from the field of education can be given. For example, how is the contribution made by "education" different from that made by the "educated" manpower? Will one get a different conclusion if the attempt were to measure the contribution made by "educated labour" to the national product? How critically dependent are the cost-benefit ratios of education on the choice of the discount rate and listing of various items on the side of social cost and social benefit. Destabilisation, e.g. is among the major consequences produced by educational or better "enrolment explosion", especially among those denied jobs commensurate with their 'formal' education, or those denied access to formal education. The process of preventing welling up frustration through unsuccessful culmination of years in universities may, in itself, be an equivalent to more forceful, tearing up of frustration. The neat calculus in terms of elegantly set out equations are too fragile to incorporate these tensions.

Those who cannot view economic relations in terms other than macro (income, investment, rates of returns, interest rate, general price levels) and micro (demand, supply, individual output, income, etc.) and do not invoke categories like social productive forces, production relations, imbalance between the two, objective forces behind accumulation and technical progress, role of contradictions in socio-economic development, can scarcely deal with the growth of material

production and sectoral balances, let alone the ticklish social science issues like correlates between education and growth.

A review is hardly the place to go into the various pitfalls and pervasive naivete originating from exercises in quantifying the non-quantifiables. Suffice it to say that simple application of Occam's razor suggests that a lot of misdirection can possibly be prevented, many ill-lit areas illumined and necessary caution introduced by analysing education in its economic perspective by respecting, rather than violating, its natural organic nature which intertwines it so inseparably with the broad social reality that, except, perhaps, for pedagogic purposes and as first approximations, it cannot be isolated at operational, policy formulation levels.

This brings us to another basic theme, which, according to the reviewer, has put such painstaking analytic acumen of the author along dysfunctional tracks. This refers to some of the pit-falls of inter-disciplinary studies based on putting the problems and theorems derived from two or more different disciplines together in order to work out their implications. When educational problems and processes are so confronted with some problems and processes of the economy, it may happen that some proposition already on their way out in the main discipline become the major preoccupation of an inter-disciplinary exercise. Our reference here is to "economic growth" in the study under reference. Both in the realm of development economies (see *American Economic Review*, May 1975, papers on the current state of development economics) and in the field of experience of development planning in India (the Draft Fifth Plan giving a qualitative reorientation to the development objectives), economic growth as reflected in the be-

haviour of time-series of national income is no more operationally relevant than a short-hand, popular depiction of aggregative performance

Growth *versus* this and that is buried in the textbooks of the sixties vintage. This is more particularly germane to the field of education which has such an omnibus coverage of social reality. It is common now to view education in an integral manner as relating to transmission of knowledge and skills, education and the economy (the focus of the present study, though even here questions of efficient allocation of educated manpower are touched upon indirectly and tangentially only), equality of opportunity, meeting individual needs and quality of personal and social life. Even from the point of view of the economy, many of these aspects are critically related to economic development. In this context, disregard of quasi-collective good nature of education (well established in traditional theory and on run-of-the-mill considerations) manifested in the author's attempt at social cost-benefit analysis of education instead of more appropriate "cost-effectiveness analysis" (owing to education's stronger links with equity as compared to efficiency) comes as a sharp reminder of its narrow focus.

Lest this point be misunderstood, we may hasten to add that even a delimited inquiry concerning the impact on growth as such has its functional and academic legitimacy. Our point is that, in the current context of India, a narrow, technocratic view not only has limited relevance but, for many reasons with which we cannot detain ourselves here, may be misleading and apologetic.

In a generally competent study like the current one, there is bound to be a good deal of meat which both practi-

tioners and academics may find pleasing. This is certainly true of the reviewer whose only lament is that owing to some basic issues, raised in the foregoing, enough space is not available to do justice to these positive aspects of the book. But for those, for whom a review is not a surrogate for the pleasure of going through a book, nothing is lost. By way of some assistance to such a reader, it may be added that the reviewer found the chapters on "Education and Equality of Opportunity" and "Education and Manpower Planning" very useful. Particularly, a good deal of factual material is carefully handled. In general, this study, in some quantitative aspects of education and growth of output in India, goes into the demand and supply aspects of education comprehensively and competently, though social demand has not perhaps received the attention which is due to it. A sharper focussing on policy implications would probably have reduced scope for polemics and added to the undoubted value of the book. It is surprising that throughout the volume, the term 'docile' is allowed to go in the place of 'decile'.

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### An Introduction to Linguistics for Language Teachers

N. Krishnaswamy, Somaiya Publications  
Pvt. Ltd., Bombay, 1971, pp vii+232

MODERN LINGUISTICS has revolutionized the field of language teaching. "Every-one readily learns and uses languages and, in a sense, when he uses it he also teaches it...When we are becoming aware of the

working of our language, of how we produce sentences and how we understand them, we are getting to be linguists" (p. vii). The present book is the outcome of the specialized awareness of the subject, as the author claims. It is a fact that the author has successfully attempted to stimulate an awareness of language in a very simplified manner.

The book consists of four sections. Evolutions, the Current Scene, Applications and Closing Words—Language & the Learner (3-14), Psychology of grammar (15-26), On Languages & Language (27-41), Pangs of Birth: the Beginnings of Linguistics (45-54), A Sea of Trouble Bloomfieldian Structuralism (55-95), Bubbles & Bubbles: Other Forms of Structuralism (96-113), Old Paths: The Traditional Approach (114-131), The Dawn: The Transformational Approach (135-178), The Iceberg: Residual Problems (179-191), The Language of the Muse: Stylistics (195-203), Where the Shoe Pinches: Contrastive Linguistics (204-210), Teaching a Second Language Methodology (211-229). We can see that these headings interestingly reflect the literary and metaphorical attitude of the author towards the trends in linguistics. Through the concept of the evolution of the earth, the author has described the evolution of linguistics in a very attractive manner.

In the closing words, the author has described linguistics as a living subject, something omnipotent and omnipresent. He pleads that teachers of languages must be aware of the modern trends in the field of linguistics and he should learn the new way and be able to dissect it. He further says that many of us make sacrifices for becoming doctors, engineers or even politicians, but no one seems to be prepared to make sacrifices for becoming

a linguist or a grammarian. The author, therefore, pleads strongly that the knowledge of linguistics is a must for language teachers. In support of his conviction, he has lucidly described all the schools of linguistics.

Here, the question arises whether the present book really helps the language teacher in his function. The book is an introduction to linguistics and not a book on the methodology of linguistics as applied to language teaching. The author has explained the linguistic points briefly, but has not tried to examine their validity and relevance to language teaching. We know that linguistics help the language teacher by giving him insight into the nature of language and deepening his understanding of it, but the author should have said how a fair knowledge of linguistics assures a better working knowledge for the language teacher.

Language teaching is an art. In teaching, many factors are to be taken into account, i.e. the aptitude and personality of the students, their intellectual capacities, their attitudes or motivations. Therefore, language teaching is a multi-dimensional and interdisciplinary activity<sup>1</sup>. Its main dimensions are organizational, technological, psycho-biological, sociological, pedagogical and linguistic. The aim of all these activities is to help the learners acquire the basic language skills, i.e. speaking, writing, reading and comprehension. Therefore, linguistics alone does not serve the purpose of language teaching. It does not have any techniques of language teaching to offer; it has no 'do-it-yourself' kit of classroom procedures to display.<sup>2</sup>

<sup>1</sup>S.K. Verma, "Linguistics in Second Language Teaching," *RELJ Journal*, Vol. 4 No 2 December 1973

<sup>2</sup>*Op cit*,

It is true that linguistics provides the scientific knowledge of the language to be taught in the classroom, but psychological contribution would be necessary in knowing how people learn languages. General pedagogical principles would play a part concerning motivation, attitudes, intelligence and personality. These are largely non-linguistic, and are just as important in the teaching of other subjects as in the teaching of languages.<sup>3</sup> Therefore, language teaching being a pragmatic business, in 'matters of classroom technique one would hardly expect linguistic considerations to carry much weight.'<sup>4</sup> In this connection, we can say that it would not be useable directly in the classroom and the author should have suggested follow-up measures for language teachers.

The present book shows a distinct bias towards Transformational Grammar. The author, ignoring the structural school, has described the Transformational Approach as the dawn after the evolution of the linguistics. The author has supported the Chomskyan approach as a new direction in linguistics. According to him, Chomsky rejected and replaced every one of the assumptions that were so popular in structuralism as Structural Linguistics is inadequate in its function. We know that a lot of work on transformational grammar has been done on the acquisition of mother tongue, but little material on this model is available for the teaching of a second language to adult learners. This can be supported by the assertion of Chomsky that language is not a habit structure but has a kind of creative property and is based on

abstract formal principles and operations of a complex kind and, therefore, he extended his particular hypotheses about first language acquisition to the acquisition of second language.

The transformational theory does not differentiate much between the acquisition of first language and acquisition of second language. But it is obvious that the two situations are different. The factor of motivation alone makes the two situations vastly different from each other. The child acquiring L<sub>1</sub>, is pursuing an activity which is crucial for his survival, while for L<sub>2</sub> learner, his motivation for learning the language and his attitude towards the L<sub>2</sub> will determine his success in acquiring the L<sub>2</sub>.<sup>5</sup> An L<sub>2</sub> learner (if he is adult) is cognitively more developed than the child learning his L<sub>1</sub>, as the L<sub>2</sub> learner has the competence in the first language whose structural aspect may facilitate or interfere with the learning of the L<sub>2</sub>. Therefore, it is true that transformation theory has given a theory of language acquisition which has described more adequately some of the facts of language learning but its claim for the second language learning has not proved justified although its hypothesis has been extended from the acquisition of the first language to the acquisition of the second language as it does not explain all the facts.

To conclude, we can say the author has given different aspects of the field of linguistics which is very useful for every one who is interested in having a basic knowledge of linguistics, though it can not be said that the book may help solve all the problems of language teaching. But it can surely be said that a closer collaboration between the linguists

<sup>3</sup> Pit Cordei, *Introducing Applied Linguistics*, Penguin, 1973

<sup>4</sup> D.A. Wilkins, *Linguistics in Language Teaching*, Edward Arnold, London, 1972

<sup>5</sup> C. J. Daswani, "Transformational Grammar and Language Pedagogy" *J S L*, J.N U. Monsoon, 1973

and the language teachers is needed for the development and betterment of language teaching

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### Error Analysis-Perspectives on Second Language Acquisition

Jack C Richards, Longmans, 1974

LANGUAGE teaching, particularly second language teaching, has long remained in the grip of behavioural psychologists. Language acquisition has been viewed as the formation of habits. Following this theory of language learning, applied linguists sought to identify areas of difficulty faced by the second language learners. For this purpose, they systematically compared the learners, mother tongue with the target language.

During the late sixties, there has been a shift in interest from a teacher-centred view to a learner-centred view in second language learning. Error Analysis is now recognised as a "chief means of both assessing the pupil's learning in degree of match between his learning syllabus and the teacher's teaching one."

This volume is divided into four parts, each containing an introduction to the papers included in that part. Part One serves as an introduction to the field of Error Analysis. It contains two papers: Richard's and Sampson's 'The study of Learner English' and Corder's 'The Significance of Learner's Errors'. Richard's paper provides an overview of the field of Error Analysis and is intended to integrate other papers in an overall perspective. The author maintains that

"the study of learner's errors does indeed throw light on the types of cognitive and linguistic processes that appear to be the part of language learning processes"

Corder observes that "learner's errors are indicative both of the state of the learner's knowledge and the ways in which a second language is learned." Corder also maintains distinction between 'mistakes' (errors of performance) and 'errors' (the marker of learner's transitional competence)

The second part, consisting of three papers: Larry Selinker's 'Interlanguage', William Nemser's 'Approximative System of Foreign Language Learners' and Richard's 'Social Factors, Interlanguage and Language Learners', is devoted to 'Theories and Models'. This part suggests ways in which the learner's speech is characterised.

By the term 'interlanguage', Selinker characterizes an intermediate stage between the native language and the target language. It is also assumed that there are psychological structures latent in the brain which are activated when attempting to learn a second language. Selinker also advances a concept of 'fossilisation' which is crucial to the study of learners' errors. He also mentions five central processes: language transfer, transfer of training, strategies of second language learning, strategies of second language communication and overgeneralization of target language linguistic material.

Nemser's 'approximative system' is a deviant linguistic system actually employed by the learner attempting to utilise his target language. Nemser's and Selinker's terms, though different, characterize the same phenomena of the learner language.

The paper by Richards suggests that

the learner's developing system 'interlanguage' is determined by the social relationship between the learner and the target language community. The distinction between the second language and foreign language contexts is also maintained by Richards.

Part Three of the volume is devoted to the developmental studies of second language acquisition in children. It also contains three papers. Dulay and Burt's 'You can't learn without goofing', and two papers by Raven 'Language acquisition in a second language environment, and 'The development of Wh-questions in first and second language learners

These papers present the result of longitudinal studies of the development of syntax in children learning English as a second language. Dulay and Burt give a critical account of the theoretical background and assumptions of process and product level and consequences in terms of predicted goofs of contrastive analysis, hypothesis and  $L_2$  acquisition =  $L_1$  acquisition hypothesis. According to them 'goof' signifies 'deviation from syntactic structure which the native adult speaker considers grammatically correct.'

Raven's studies attempt to trace the development of syntax in the second language. He maintains the qualitative difference between the first language learning and second language learning. Thus, he conceives of the process of the first language and second language learning to be quite different. In his second paper, Raven stresses the need for a 'comprehensive language learning theory which should take into account general cognitive factors and not only linguistic mechanisms.'

The fourth part of the book is concerned with the error analysis of the adult

language learning and methodology of error analysis. Three papers are included in this part: Corder's 'Idiosyncratic Dialect and Error Analysis, Richards' 'A Non-contrastive Approach to Error Analysis' and M. P. Jain's 'Error Analysis, Sources, Cause and Significance.'

Richards in his paper highlights the distinction between the Interlingual and the Intra-lingual errors. On the basis of his study, he has concluded that there are several types of errors, observed in the acquisition of English as a second language, which are not derived from the transfer from native language. He also maintains that by studying intralingual and developmental errors within the framework of a theory of second language learning and examining typical cases of errors, it is possible to know the learner's strategy of acquiring a second language.

Jain, in his study of Indian English with plenty of examples, has tried to "reinforce the position that the conceptual framework for the study of error source and significance based on contrastive study of the contact language is fragmentary and is therefore inadequate." With the help of confirming evidence from the learner's performance data, Jain's paper highlights  $L_1$  independent errors. He points out the need for a methodological framework to account for  $L_1$  and independent errors. He maintains that the first and second language learner use developmental process of speech reduction. This reduction is affected through generalizations. He has also introduced the concept of 'asystematic' errors along with the available concept of systematic and unsystematic error.

In a nutshell, the present volume presents an overview of the related fields of Error Analysis. Error Analysis has

important applied linguistic justifications in that the data from the actual classroom can both serve as an input to theoretical discussions and after evaluation, feed back to the design of remedial curricula.

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### A Contrastive Study of Hindi-English Phonology

M G Chaturvedi, National Publishing House  
Delhi, 1973, pp 135, price Rs. 15 00

ENGLISH is being taught to Hindi speakers in India and, if we take the present demand of Hindi in the International scene, Hindi is also being taught to many English speakers. Therefore, it is only reasonable that a contrastive study of the two languages be carried out. The author of the present book has, however, confined himself to only the phonological aspect of the two languages. One can see the importance of phonology for all modern languages whether taught as a second or a foreign language.

The author has covered the segmental and supra-segmental phonemes of both the languages. The book describes in detail various subsections as comparison of Hindi-English vowels and consonants, syllabic structure, stress, timing, intonation and juncture. Thus, the book covers practically all the aspects of phonology of both Hindi and English.

One encounters an unequal emphasis, biased more towards Hindi than English in the author's phonological description. This, however, seems justifiable in that many more analytical works on English

phonology are available than in Hindi (Cf Daniel Jones, Tiger Smith and the work done in the Central Institute of English and Foreign Languages, Hyderabad).

A linguistic approach to teaching of languages is rather new to Indian teachers. The teachers of English will find the book particularly useful. Normally, an automatic parallelism is adopted for teaching English sounds to Indian students. Although sufficient tolerance for this exists among the Indian listeners of English, it becomes a problem in the context of communication with native speakers of English. With an increasing demand of Indian teachers of languages and other subjects elsewhere, a change in our approach to teaching English has become urgent. To that objective, the tables of contrasts supplied by the author are likely to be extremely useful.

One would have been happier if other contrasts would have been mentioned in the book and sufficient examples from actual classroom situations would have been supplied to make it more usable for the teachers.

C. H. K. MISRA

### Introduction to English Language Teaching: Volume I Linguistics

S K Verma, Central Institute of English and Foreign Languages, Oxford University Press,  
New Delhi, 1974, pp 52, Price Rs. 7 00

THIS small book is the first of a series intended to introduce university and college teachers of English to some basic concepts underlying the teaching of English in India.

The first chapter deals with the nature and varieties of language. It shows how



language is a system of communication, and differentiates between animal and human language and touches upon components and properties of human language. There are some very interesting observations. 'There is no such thing as inefficient language, And there is no truth in the statement that language A is richer than language B; Any language is as good as any other language, in the sense that every language is equally well adapted to the uses to which the community puts it' 'The differences between languages and dialects are for the most part cultural and political'.

The chapter 'Linguistics The Scientific Study of Language' gives a brief outline of the theory and description of a language, it defines and illustrates 'linguistic universal', and lists branches of linguistics with examples, and briefly discusses aspects of the linguistic sciences like phonetics, phonology, graphology, grammar and morphology. Immediate constituent analysis and phrase structure grammar have been taken up in the third chapter. The treatment of 'Transformational-Generative Grammar is concise and lucid. The contributions of linguists like Charles Fillmore, Sydney Lamb, Kenneth Lee Pike and M.A.K. Halliday have been briefly mentioned. Problems and principles of contrastive linguistics is the topic covered in the last chapter which runs into four pages. The book is going to be a sort of a primer useful for those who wish to study linguistics

ASHOK MATHUR

Journal of Lal Bahadur Shastri National Academy of Administration

Ed R. C. Kapila, National Academy of Administration, Mussoorie, July 1974, pp. 232, Price Rs. 4.00

THE VOLUME XIX No. 1 of July 1974, of the Journal of the Lal Bahadur Shastri

National Academy of Administration, Mussoorie, is a special issue devoted to linguistics and language teaching. It has about twenty-one papers, fourteen in English and seven in Hindi, besides the foreward in Hindi by Shri R. P. Naik, a book review, a select bibliography of applied linguistics and language teaching with special reference to the modern Indian languages and a list of instructional material developed in the Academy for the teaching of thirteen modern Indian languages.

As the Academy has been preparing and training the I. A. S. officers for all-India services, it is but natural that it teaches Hindi and other regional languages recognised as the state official languages. It seems from the list of the instructional materials developed in the Academy, that it has been teaching modern Indian languages according to the principles of modern linguistics, programmed learning and educational technology. Thus it has given a lead in the field of language teaching in India, where traditional methods and materials are still used in language teaching in most of the educational institutions.

The papers on 'Linguistics and Language Teaching' by Prof. S. K. Verma, 'Preparing Language Teaching Materials' by A. B. Singh and 'The Place of Mother Tongue in Teaching/Learning Second Language', by V. R. Jagannathan, are significant studies. But editing and the printing of the Journal is not up to the mark. There are many printing mistakes and quite a few instances of grammatically incorrect use of language.

M. G. CHATURVEDI

Reader

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# Books and Periodicals Received

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GANGULI, H C , *Foreign Students: The Indian Experience*, Sterling Publishers Pvt Ltd., New Delhi, 1975, pp. 127, Rs 25 00

GUPTA, A K , *Examination Reforms--Directions, Research and Implications*, Sterling Publishers Pvt Ltd , New Delhi, 1975, pp 226, Rs. 40.00

HALLEN, G C., and PRASAD RAJESHWAR, *Sorokin and Sociology*, Satish Book Enterprise, Agra, 1972, pp. 380, Rs 35 00

LANGUAGE FORUM, *A Journal For the Teachers of Language and Literature*, Vol 1, No 2, July-Sept., 1975, New Delhi, Bahri Publications Pvt Ltd , Annual Subscription' Rs 5.00, single copy : Rs 4.00

MOTWANI, KEWAL, *Towards Indian Sociology*, Satish Book Enterprise, Agra, 1971, pp 138

PRASAD, RAJESHWAR, HALLEN, G C and PATHIAK, KUSUM, *Conspectus of Indian Society*, Satish Book Enterprise, Agra, 1971, pp. 608

SRIVASTAVA, R C , *Students' Participation in Administration*, Sterling Publishers Pvt. Ltd., New Delhi, 1975, pp. 168, Rs. 30 00.

# Annotated Bibliography on Linguistics & Language Teaching

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ALLEN J. P. B. AND CORDER S. P. (Ed.). The Edinburgh Course in Applied Linguistics, OUP

Vol. I (1973): *Readings for Applied Linguistics*

Vol. III (1974): *Techniques in Applied Linguistics*

Vol. II (1975) *Papers in Applied Linguistics*

With the fourth volume of the series on *Testing and Experimental Methods* yet to come, the series could be called classic for language teachers.

The first volume aims at providing the man in the field a broad-spectrum background knowledge of different schools in linguistics and their recent trends and linguistic theories in order to enable him to understand his work better. The nature of language, linguistic theories and their application to language form major part of the volume. Besides, recent theories, functions of language, varieties of language in social use and language as a symbolic system have been included. The excerpts from various authors are representative of their writings and editors' critical note precedes each section, explaining the theories. But the issues are so complicated that this volume may not appear lucid at the first reading. Nevertheless, it is a commendable collection and a must for the student of language.

Volume III includes eleven sections on known topics to language teachers as

Language Lab, Reading and Writing, Audio-Visual Materials, Language Testing, Contrastive Analysis, Programmed Instruction, etc. The editors are in consonance with time, by including topics as Pedagogic Grammar, Error Analysis, Styles, Course Designing, etc. There is a marked departure from the age-old audio-lingual method and the authors of various sections as well as the editors have kept conscientiously aloof from any theoretical pull. The chapters are well within the comprehension level of the teachers. This is an indispensable volume for an up-to-date knowledge of the field.

The second volume forms a proper background study for understanding the field of language teaching by including sections on the relevance of linguistics to language (especially grammar, phonology and semantics in language teaching), socio-linguistics and psycho-linguistics. In fact, all the three major areas of linguistics have been summarised in one place, which in itself should be an achievement. The last section on theories and strategies for language learners analyses different

points of view. The volume is encyclopaedic in character.

A book similar to the format of these volumes is:

WIDDOWSON H. G. (ed.), (1971) *English Studies Series—Language Teaching Texts*. O.U.P. The added feature of this book is the programmed notes and exercises that go with the texts.

CHAUHAN, M. M. AND SHARMA, L. N. (1974), *Dvitiya Bhasha Shikshan* (Second Language Teaching Hindi), Bahri Publications Pvt. Ltd.

*Bhasha Path Niyajan* (Language Lesson Planning—Hindi).

The first book follows the same pattern as other structure model books with four chapters on the skills, and other chapters on methods, analysis, culture, testing, language lab, etc. With copious examples in Hindi, it is a good companion to Hindi teachers.

The other book suggests the techniques of planning various language lessons; especially useful for the beginning teacher.

CHRISTOPHERSEN, PAUL: (1973) *Second Language Learning*, Penguin.

This is a short account of various issues concerning language learning, consisting of five sections on myths about language learning, linguistic background, definition of native and foreign languages, bilingualism and language planning. It presents a very authoritative summary of various theories and the author has probed deep. The notions of second and foreign languages have been defined for the first time. An artistic rendering, useful even for the layman.

CORDER, S. P. (1973), *Introducing Applied Linguistics*, Penguin.

The book comprises three parts: Languages and Language Learning, Linguistics and Language Teaching, and the Techniques of Applied Linguistics. The first part deals with the social meaning of language, its place in the society, its functional roles in communication with its various forms, its place in culture and linguistic relativity. The second part deals with linguistic theories and their relevance and contribution to the field of language teaching. Chapter 8 is important for the discerning readers, as it analyses the validity of different models of grammar in framing classroom activities. The third part includes the pedagogical aspects of language from framing the syllabus to testing language achievement, traditionally described under: Selection, Gradation and Presentation.

The author has creditably managed to present on a very wide canvas all the aspects of the problem of language teaching, starting from language planning, down to classroom activities. A very useful reference guide for a proper understanding of the field.

DORBYN, MICHAEL: (1971), *Preparation of Language Teaching Tapes*, CIIL, Mysore.

This book gives a brief and comprehensive account of the machinery of the language laboratory, lab organisation and various other points regarding software preparation, course designing, reading, editing, lab operation and classroom follow-up. The different types of tape lesson in the appendices can guide the readers in preparing lessons. Necessary for all language lab and interested teachers. Further advanced readings are;

HAYES, A. S., *Language Laboratory Facilities*, OUP

STACK, E. M., *The Language Laboratory and Modern Language Teaching*, OUP.

GUMPLER, J. J. ET AL (1962), *Conversational Hindi-Urdu* (Vols I & II)

This is the first book attempting to provide a structural model of lessons for the teaching of Hindi. The book follows the dialogue drill method where a conversation is given for memorisation and drilling of some patterns of the dialogue is conducted thereafter. Lessons further include pronunciation drills, grammar and culture roles.

FAIRBANKS, G. H., MISRA, B. G. (1966), *Spoken and Written Hindi*, Cornell University Press

This is another commendable book in the same model. The strong point of this is its exhaustive grammatical notes, as distinct from the preceding book

DUBEY, K. N., ET AL (1971) *Hindi as a Second Language*, NAA, Missouri

This is another of the same genre with similar notes as those of the preceding two.

KRISHNASWAMY, N. (1971), *An Introduction to Linguistics for Language Teachers*, Somaiya Publications (Pvt) Ltd, Bombay

The book could probably be called 'linguistics for all' as it does not include things meant only for the teachers. Written with a definite leaning towards transformation-generative grammar, it scans the history of linguistics starting from Sanskrit with brief summaries of major schools, authors and trends. The

author, all the time, keeps comparing the trends with TG Grammar. A useful starter, especially for the students of linguistics.

LADO, ROBERT (1957), *Linguistics Across Culture*, Ann Arbor, (1961), *Language Testing*, Longmans, London (1964), *Language Teaching*, McGraw-Hill Inc

Robert Lado, a close associate of C. C. Fries, in formulating the structural method of language teaching in the early forties, has followed the latter in explaining the method in *Language Teaching*. This book is more widely known than that of Fries as it seems to be addressing the beginner, with comprehensive explanations. It also includes copious examples and useful diagrams. It is a readable exposition of Audio-Lingual method based on Bloomfield's structural linguistics

Language testing is equally meticulous in analysing and exemplifying different steps for testing the achievement of the four skills of language. A real milestone, though one is apt to question the relevance of presenting the minutest details

*Linguistics Across Cultures* is virtually a book on language contrasting. It presents the techniques for sounds, grammar, vocabulary, writing and culture

The author feels that comparison of languages will help discover and describe problem areas of second language learners and may be helpful in preparing teaching materials accordingly. Culture, according to structuralists (particularly, structural anthropologists), is inseparable from language; a tradition which was followed by all structuralist in language teaching.

BROOKS, NELSON (1960), *Language and Language Learning*, Harcourt, Brace & Co NY

This is another commendable book for further reading in the tradition of audio-lingual method.

RIVERS, WILGA M (1968), *Teaching Foreign Language Skills*, University of Chicago Press

This book may be said to be the finale of the long tradition of Audio-lingual method, though the author has compromisingly summed up the points of view of both structuralists and transformationalists. The main contribution of the book apart from its being a worthy document of in the field of language teaching, is the author's approach to the teaching of skills. She feels that skill teaching does not suffice and emphasizes the teaching of language items too, particularly, sound and grammar. The ideas have been presented in a lucid and concise manner and the author touches upon most of the controversial issues on the subject for discussion.

STEVICK, E. W. (1971), *Adapting and Writing Language Lessons*, FSI, Washington

This book is as useful for language teachers as Nida's Morphology is for students of linguistics. Stevick is the man who propounded the microwave approach to language teaching and this is the first book which could be called a workbook for course-designers and material-developers. In microwave theory he strikes a balance between structuralism and transformation wherein structural oral drilling finds a place along with developing expressive skills in different contexts. The aim of the approach was

to produce materials for languages seldom taught and accordingly were developed for many languages. It contains courses of and examples from about 14 languages.

VALDMAN, A (ed.), (1969), *Trends in Language Teaching*, McGraw-Hill Book Company

This is the first book with a distinct bent towards analysing language teaching in the light of developments in transformation generative grammar, as contrasted with the earlier works on structured model. It contains 14 articles by eminent scholars. The notable trend is that language teaching has been viewed in the perspective of socio- and psycho-linguistics—the two major developments in the field of linguistic in the late sixties.

CENTRAL INSTITUTE OF HINDI

(a) *Path* (Text), 1973

(b) *Sancha Abhyas* (Pattern Practice), 1975

(c) *Abhyas* (Exercises), 1974

(d) *Karyalaya Hindi* (Official use in Hindi), 1975, OUP, Delhi

The four volumes constitute the materials for teaching Hindi in a three-month intensive course for officers of the Government of India. Hence the inclusion of the fourth volume. The rest of the volumes aim at developing competence in the use of the language through intensive structural drilling. These materials were developed by a team of teachers who were engaged in teaching.

The first volume, *Text*, provides contextual reference to the sentence patterns to be taught. Major sentence patterns of Hindi have been introduced through graded lessons. The second volume, *Pattern Practice*, allows for oral drilling of the patterns introduced. It

has substitution tables, transformation, question-response drills and has instructions to teacher for further practice. The third volume, *Exercise*, tests the language competence attained through oral practice.

It is for the first time that such an elaborate course has been developed for the adult Indian learners of Hindi. The series is a must for all institutions and an indispensable companion to teachers of Hindi.

JAGANNATHAN V R & BAHRI U. S (1973), *Introduction to Spoken Hindi—A Microwave Approach*, Bahri Publications Pvt Ltd

This book is the latest in the field of Hindi language teaching, written on the

basis of Stevick's microwave theory. It follows the method of achieving competence in the language through oral practice in appropriate situations. Thus, it combines oral practice with the theory of creative knowledge of language. With notes on grammar and culture, it serves the purpose of learning the language in a more methodical and systematic manner.

Similar attempts for other languages are the course for Punjabi by U. S. Bahri, for Kannada by Krishnamurthy.

V R JAGANNATHAN





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## CONTENTS

### i EDITORIAL

- PROF. RAIS AHMED 1 New Perspectives in Science Education
- J. S. RAJPUT 8 Approaches in Teaching of Physics
- S. P. SHARMA 13 Piaget and Reorganization of Science Education at Primary Level
- B. SHARAN 18 The Physics Curriculum
- S. G. GANGOLI 21 Open-ended Experiment in Physics Teaching
- S. N. DUTTA 25 Physics for the Future
- K. MITTAL 29 Solar Energy
- H. B. MAJUMDER 33 Non-formal Education : A Strategy for the Universalization of Primary Education (Document)
- R. K. YADAV 39 Improving Dimensions and Effectiveness of Community Participation in the Educational Decisions in Rural India (A Report)
- R. M. KALRA 49 Physics in Medicine

54 EDUCATIONAL NEWS

62 BOOK REVIEWS

65 ANNOTATED BIBLIOGRAPHY



# Editorial

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THE PRIMAL CURIOSITY of the ancient natural philosophers was about the 'stuff' the world was made of. Their intriguing speculations on the nature of matter, or the properties of substances, persisted through centuries. In fact, the questions asked by Anaxagoras about 2,500 years ago remained a point of departure even for the post-Newtonian physicists.

This persistence is illuminating because though the forms of the questions have apparently remained the same, the modern physicists ask them in the light of numerous new sciences and deeper experimental experience. From the mechanistic and predictable world of 'solid' matter it has been a long and eventful odyssey to the fourth state of matter—the plasma world. And Heisenberg's 'Uncertainty Principle' has put an end to "the tight little, nice little world" we had been living in even till the end of the nineteenth century.

Paradoxically, the natural philosophers' questions could not be answered because the modern physicists' deeper knowledge forbade it. A straight and final answer to any of the old questions is impossible because of the rapidly growing knowledge of new natural forces and a deeper insight into the structure of matter. The natural philosophers' assumption of the solidity of matter, for instance, can no longer remain a valid parameter in the modern physicists' enquiry. This radical change in the content of enquiry was brought about when Sir J. J. Thompson (and Crookes and Lenard) started nibbling at the 'fundamental and indestructible' atom. And in the wake of it came discoveries and technological inventions that made a straight answer to a fundamental

question more difficult. From the modern physicists' standpoint the old questions may appear irrelevant or even pointless.

The knowledge of the nature of matter may lead to a better understanding of the nature of the universe. The quest is unending. Because the subject of the quest is unending, spreading (or expanding ?) into infinities of space-time and matter. But meanwhile, the application of the physicists' knowledge has been changing the mode of our living on this planet. This is the point to which a common man's hopes and fears converge.

Physics is a sobering experience and on intellectual plane it demands two things from the students, unconditional humility—our total quantum of knowledge is so small beside the vast (or unending) unknown; and the unclouded awareness that there is no place for dogma or 'loyalty to the old masters' in his researches (or, for that matter, in any scientific enquiry).

Nothing axiomatic, nothing *a priori*. Everything is tested, verified, re-tested and applied for the next enquiry. It is a long ruthless process of induction. One single instance to the contrary may tear down the most convincing, the most logical of theories. We have seen that the Bohr model of atom, which was so convincing and so handy in the beginning, broke down in our hands, leaving numerous and unpredictable particles, compelling us to think of the anti-matter.

On the material plane we have seen that the reaches of our enquiries are limited by the existing technology. Leonardo da Vinci's design of the flying machine and his findings on aerodynamics could not leave the parchment surface because the contemporary technology was not sophisticated enough. But then, we have also seen that technological development is invariably tied up with the development of sciences, particularly physics.

Physics education, as part of our 'science for all' programme, has to take all this into account. It should be more concerned with the nurturing of the scientific attitude among the students than being a cumbersome repertory of 'scientific facts' which the students will learn by rote only to find them miserably dated in their later years. The students' curiosity has to be aroused and their power of observation sharpened, and they should be convinced of the value of test and experimentation. The approach and pattern of science education has to change if we want to change our mode of living with the help of technology. □

# New Perspectives in Science Education

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PROF. RAIS AHMED

*Director, NCERT*

WITHIN THE FEW decades since independence we have observed at all levels in India a several fold increase in the number of those studying science. Not only has there been an expansion in science education, but the standard of science education is considerably higher than that prevailing before independence. Our scientists and technologists have successfully collaborated to make us undisputed members of that most exclusive of international clubs—for atomic energy and space research. However, having been a teacher for almost a quarter of a century, I cannot help feeling unhappy with the quality of the science education which we provide to our young students and, especially, with the teaching methods associa-

ted with it. This probably means that the potential in our country is much more than the actual achievement.

One sees that there is introspection among scientists in every country regarding education in science, particularly higher education. One of the factors that has led to considerable soul-searching is the falling enrolment in science. This fall has been observed in one country after another and it now seems to be occurring in India too. Although we cannot necessarily conclude from this that the reasons are everywhere the same, the one reason that is most commonly put forward in international discussions is that of the "relevance" of science. It is often said that the type of science edu-

cation we provide today does not reflect the expectations of both the students and society as a whole

### *Does it fulfil objectives of education ?*

The first notable feature of science education today is that it fails to fulfil almost any of those objectives of education which we have identified as being essential. In other words, it is not 'education' in the broad sense of the word. Personally, I feel convinced that the Kothari Commission stated the correct position when they said that education is an instrument of social change—in fact the only instrument of peaceful change on a grand scale. By means of education we would wish to transform our semi-static, traditional society into a dynamic modern society. The negative features of culture, attitude, and habit, which prevent us from accepting change and working for it, would have to be eradicated through education. The question is, however, whether we can honestly say that our science education is playing such an active role or even shows any awareness of it. I think that it does not. The scientist and science educator do not seem to care and seem to take a neutral stand. "Education is not our business, we will talk about the law of gravity" seems to be the prevalent attitude. The country's goals may have been repeatedly spelled out by popular leadership and by parliament, as socialism and social justice, democracy, secularism, and national integration, but how does science come into this picture ? I hope that there would be no controversy about saying that at present education in science does not concern itself with social problems. And even where such education is extended

to acknowledge the economic motive, it merely leads us to equate science with technology. Of course, there may be controversy as to whether science education should or should not become involved in these issues, although our country and most other developing countries have set the controversy aside.

### *Is it truly science education ?*

For the moment let us, too, leave aside the question of the involvement of science education in social concerns and in the struggle for national development (which happened to be the caption of the Kothari Commission's Report); though let us not deny the importance of such questions. Let us ask a different question: do we teach science to understand the anatomy of a machine or to help understand the contemporary civilization ? Personally, I think that an understanding of traditional physics, chemistry, biology and similar subjects is necessary in order to live (and earn a living) in this age of increasing use of science and technology and also in order to make a constructive contribution to society, but it is even more necessary to understand the scientific method and the meaning of "open enquiry", the outlook of confidence as well as humility before the unknown, both of which are natural features of that method. Such things science should inculcate in its students. Confidence, because by the scientific method the unknown has been, to some extent, successfully explored and at least can be confidently faced in the future. Humility, because the explosion of knowledge can also be called an explosion of ignorance. Humility, also, because in science we do not give instant, aggressive answers about everything, begin-

ning from the creation of the universe to its annihilation. We must study science then, as a part of human culture. Scientific knowledge is the fruit of the human struggle to grapple with the processes of life and the world that surround us and this knowledge has grown in intimate and organic relationship with our civilization. We must therefore give science its *natural* and due place in the scheme of education.

*"Systematic exposition" of knowledge and memorization of facts*

Quite in keeping with the highly restricted and stultified, utilitarian view of science, which we have so far adopted, the method of teaching has been to put a great deal of emphasis on the learning of facts or the acquisition of knowledge, in contrast to the identification of concepts and the understanding of their meaning and significance, concepts which enable us to order these facts into a much smaller number of significant patterns. So strong is this tendency to emphasize the importance of learning the facts that when one talks of standards these days one simply means the level of knowledge. Our standards have, for instance, to compare with those in England, therefore, we must teach the same subjects that they teach, in the same way, and to the same extent. If a wider knowledge and a surer grasp of the fundamental concepts are involved, if an appreciation of the scientific method, as applied both to science and to disciplines outside science, is involved, if the basic principles of education are concerned, what have we to offer as a comparison? The narrowly restricted view of science education leads us to the commonly observed pattern of didactic presentation by the teacher and of memorization and reproduction by the

students. Examinations, have largely served to encourage these methods. The drill followed by the grill promotes a particular type of learning and scholarship.

On the contrary, what we wish to do is to create in the students the ability to solve new problems on the basis of their knowledge and understanding, to learn in order to create new knowledge. The daring, the lack of inhibition, the tolerance of non-conformity must indeed be cultivated in the individual, just as those passive qualities are cultivated at present. Now science, with its openness, its saga of discoveries and adventure, and its great controversies, is a subject well suited to promote just those qualities which we desire. These exciting aspects of science are all too often ignored in favour of giving a "systematic exposition" of the facts, which, I am afraid, simply replaces old dogmas with new.

To summarize, then, science education must share the responsibilities of education in the fullest sense of the word. It must be based on science as part of human culture, so that citizens are able to comprehend their environment and to interact with it in a meaningful way, while making a critical appraisal of all the implications. Science education must help develop the creative faculties of the students. If this is not done, science remains rigidly circumscribed, the purpose of education is lost, and the individual is inhibited from making imaginative forays into the sphere of the unknown and of seeking solutions relevant to society as a whole. This is a state of affairs which we should feel concerned about and which we should try to remedy. It is obvious that far-reaching changes in the basic philosophy of science education are necessary, which, in its turn will require imaginative new curriculum ma-

terials and teaching methods. I shall now mention some of these changes particularly for the basic levels of education.

### *Integral view of science and social life*

In the first place, the intimate relationship between science, social science, and the humanities, which we observe in our environment and in our society, should be reflected in the curriculum, particularly at primary level. In reality, we find that there are 'things' and their 'relationship' with other things, but we mostly study things and ignore their interrelationship. Roads, building, clothing, food, animals, plants, disease, laws, folklore, etc. can be studied simultaneously from many different angles, some scientific, some socio-scientific and some humane. I prefer to call this "horizontal cross-section"<sup>1</sup>, which brings out the living relationships between objects and the physical and social environment. This highlights the interpenetration of science, social science, and the humanities, and such an approach seems both correct in principle and as a practical necessity for teaching science.

### *Environment as a laboratory*

It is obvious that the preparation of

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<sup>1</sup>For example, one may study plants as such in depth, but one can also study their interrelationship with weather, soil, animals and man. One can study the scientific aspects of a single plant, that is, the geological, chemical and physical aspects, but one can also study its relationship with other plants in the eco-system, or its economic importance to man. Of course, plants, too provide the artistic backdrop to our world of vision and experience.

educational material of this kind requires a collaborative effort between those who are often at present thought of as existing in separate categories—physicist, chemists, biologists, social scientists of various kinds and humanists of all sorts. This, in turn, requires that the set pattern of the syllabus be broken up. It also means new learning for teachers. The present B.Sc's or M.Sc's, who are generally given a comparatively high specialized training, would not be able to handle the new kind of teaching, unless they themselves are reoriented. Yet, when one speaks of the necessity of introducing science education from the first to the tenth class, one is immediately faced with the attitude of mind that emphasizes the necessity of providing 'qualified' science teachers and apparatus (kits) for all the school. The new approach to science education, which is being advocated here, would require a reorientated graduate of arts, social sciences or science to take on the teaching with the aid of appropriate resource material. He (or she) would use the environment as a laboratory and would not become a slave to artificial experimentation through kits.<sup>2</sup>

### *Small research activities as part of education*

The second strategy which both supplements and complements the first, is to use the environment as a basis for research and enquiry. One may call it study of science through the enquiry or research method and such an approach is now becoming quite well established. As a direct result of this method of teach-

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<sup>2</sup>The concept of environmental education and its methodology is being developed separately.



ing, students have, for example, carried out investigations into local plant diseases and the effects of soil, water, and fertilizers on crops, have studied animal habits, and have collected data on family organization, family finance, eating habits, nutritional levels, disease patterns, land holdings, sale of essential commodities through shops, transport, and so on. This approach could be extended to include a study of usual technology, whether it is the traditional machine for drawing water or the bullock cart, or the bicycle, or even the transistor.

Studies through student enquiries of this kind would not only be educative for the children and provide them with the thrill of finding out facts and trying to piece evidence together in order to arrive at an explanation, but also some part of the study might well fit into the investigations carried out by trained research workers and thereby contribute significantly to the collection of data and so to proper research findings. The creative role of the teacher as well as the scholar would emerge through these activities and would perhaps lead to schools attracting good intellect and may be even scarce finance. It is possible that these activities could be given a new direction of the Central and State agencies working in the fields of agriculture, health, community services, etc. were to interact with the teaching community to identify what particular investigations into plants or animals or social phenomena may be undertaken so that there is a greater likelihood of their contributing to the national stock of knowledge or the national surveys<sup>3</sup>.

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<sup>3</sup>For example, studies of this kind have been carried on in Sri Lanka under the Field Science Programme.

### *Importance of techniques and materials*

The third facet is the modification of the teaching-learning material itself, so that it goes beyond the trinity of physics, chemistry and biology. There are aspects of astronomy, geography, biochemistry, anthropology, etc. which, besides being of direct interest to human life, also appeal to man's natural curiosity. It is suggested that these areas of learning should not be ignored, nor should we fail to give correct emphasis to technology, because it can serve to illustrate how ideas drawn from many different disciplines are combined and concretized in the production of various commodities. In this sense, an electric motor need not come at the tail end of teaching in electricity, it could be the beginning. It has copper, iron, carbon brushes and so on, the making of it involves knowledge of metallurgy and application of casting techniques, the techniques of electroplating or insulation are based in chemistry, and, of course, the motor utilized the principle of electromagnetic induction. Transistors, polishes, paints, medicines and many other useful products could be spoken about, shown, studied and otherwise brought into the orbit of science education in a similar way.

### *Use of historical approach*

I believe that the historical approach to scientific discovery, which seems to have been given up due to the need to learn facts which are given in ever increasing numbers, has to be revived. The theory of evolution or of gravity, the discovery of fire, the invention of paper or the aeroplane, the development of new fuels, especially atomic energy,

have all contributed to the development of human society, social struggle and social change. Therefore, these aspects of history and of ideological conflict, ultimately the conflict between tradition and dynamism, sometimes between rationalism and obscurantism, would certainly be brought to the notice of the students, at the high school level. If education stops for a large number at the high school stage, ignorance of these aspects would be far more grievous than of missing out a sprinkling of facts here and there. Through science, an adolescent should come face to face with the reality of life.

The history of ideas and inventions could underline the scientific method and outlook. Perhaps it would be proper to highlight this aspect in each story of progress and discovery just as the moral of a story is sometimes highlighted. Let awareness of the reasoned approach, of its contribution to the present state of society, be emphasized in lectures and discussions with the senior students. Let the interaction between science and society, the effect of science on society or the reverse, be brought to the notice of students so as to show, for example, that the achievements in a given sphere may be discouraged by a particular policy or by the customs of a country, that the needs of war and peace are different and hence their effect on the progress of science is also different. There is no doubt that teaching units of this kind can emphasize the interaction between science and social science and can contribute to integral understanding of contemporary life.

#### *Science, productivity and society*

One final point on strategy, which I

want to mention is that bridges between theory and practice, and between science and technology, on the one hand, and the needs and aspirations of the people on the other hand, cannot be built in the field of education alone. They must be realized in real life also, so that education may be relevant to social needs and arises out of those needs. I believe that a step long overdue in our country is to have interaction councils in each group of districts in the country. In such councils of each region there should be representatives of :

- (i) Productive establishments such as farms, refineries, major industries or workshops and major commercial interests;
- (ii) Government departments which are concerned with existing economic establishments and with planning and which may therefore know the present and the future developmental needs of the region;
- (iii) Research and educational establishments in science as well as the social sciences.

These interaction councils could discuss how the representatives of these three groups in each region could interact and help development. They could discuss vacations relevant to the region, how and what kind of research in science and the social sciences could lead to further growth and development, how facilities of training and placement and also hardware could be shared and better utilized, what projections could be made for the future, for instance, new industries or crops or institutions, what voluntary student service could do and how the personnel of these sectors could, on a part-time basis, share in each other's work. A

few meetings a year and a follow-up programme through a small secretariat could bring about real grassroot planning, the integration of educational researches and productive activity. The results of the interaction council's work would provide most interesting material for the school courses and college seminars and the relevance of this material would be immediately apparent. I would like to emphasize that, in the whole complex of new ideas in science education, the suggestion of regional councils or forums of interaction is of crucial importance.

I have not given here a picture of how this general reorientation could be effected in textbooks, in supplementary readers or

in practical work. Nor have I suggested which modified activity would be appropriate for which age group. But then these decisions are not very complicated. What is important is that science education should depict science and the scientific method in their proper context and that they should be closely related with and directed towards education in the widest sense of the word. If scientists and educationists can be convinced to go along in this direction, then I have no doubt that the programme outlined above could be given a practical shape, thus enabling science education to play its rightful and expected role in national development. □

THERE ARE two methods in which we acquire knowledge—argument and experiment. Argument allows us to draw conclusions, and may cause us to admit the conclusion, but it gives no proof, nor does it remove doubt, and cause the mind to rest in the conscious possession of truth, unless the truth is discovered by way of experience, e.g. if any man who had never seen fire were to prove by satisfactory argument that fire burns and destroys things, the hearer's mind would not rest satisfied, nor would he avoid fire, until by putting his hand or some combustible thing into it, he proved by actual experiment what the argument laid down; but after the experiment has been made, his mind receives certainty and rests in the possession of truth which could not be given by argument but only by experience. And this is the case even in mathematics, where there is the strongest demonstration. For let anyone have the clearest demonstration about an equilateral triangle without experience of it, his mind will never lay hold of the problem until he has actually before him the intersecting circles and the lines drawn from the point of section to the extremities of a straight line.

ROGER BACON (1214-1294)

# Approaches in Teaching of Physics

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THE COUNTRY has made notable progress in science and technology during the last two decades. Our scientists have placed India among the few countries which have been able to exploit science and technology for the benefit of humanity. In several areas of scientific research, our scientists like Prof Chandrasekhar, Dr. Hargovind Khurana and many others have the distinction of reaching the top. To sustain this progress in science, considerable attention has to be given to the teaching of science at all levels. It is time we critically reviewed the science education in this country and find out whether it really fulfils its objectives in the context of

industrialization and the changing socio-economic patterns.

Education has been acknowledged to be the only instrument of peaceful social change, and there is hardly any need to emphasize the importance of science education. Modern society is based on science and technology. These days, one has to have basic knowledge of science and technology. This becomes still more important as the scientific methods are not limited only to science. Science helps in reducing built-in prejudices and transforms the traditional society. It helps in eradicating such attitudes and habits which prevent the society from accepting the change.

The subject of physics enjoys certain advantages in the present day development but at the same time suffers from some unusual handicaps. It has earned the stigma that it rejects the human factors such as emotion and taste in making decisions. The teaching of physics in our schools seems to be separated from the "actual things and the real understanding" of the fundamental concepts of natural processes. It is mainly syllabus and examination-oriented. In this set-up the creative talents are not fully nurtured. Here propose to consider some of the significant characteristic features of physics teaching, which a teacher may consider to help his students develop and cultivate a clear perspective of the subject. Contrary to what has been followed in the past, physics will have to be considered as a human activity and not as something confined to some ivory tower accessible only to few

### *The interdisciplinary approach*

The teacher of physics has to understand that knowledge is indivisible and segmentation into various subjects is a matter of convenience. Specialization will not be in the best interest of the teacher and the pupil at lower level, particularly when the children are looking into the world around them. An interdisciplinary approach will naturally introduce the students to areas like biophysics, biochemistry, life sciences, astrophysics etc. and may very well extend into the field of social and economic sciences. The intimate relationship between physics and other sciences and the humanities will have to be reflected in the curriculum. The extent to which this can be achieved will obviously depend on the level at

which we are considering the teaching of physics. Several examples can be cited where the interdisciplinary approach has established its importance and significance. It is the realization of significance and utility of this approach which has resulted in the development of new disciplines which were unheard of a few decades ago. It was only the combined knowledge from the disciplines of mathematics, chemistry, biochemistry, physics (crystallography) which helped us in understanding the genetic code. While studying physics, the related and associated areas of learning should not be ignored and it is here that it can be easily illustrated as to how the ideas drawn from different disciplines can be usefully combined and exploited. Let us take the example of the voltaic cell. Its study should necessarily involve the knowledge of metallurgy, electroplating and insulation apart from the understanding of the movement of electrons. This immediately requires a well thought out coordination in the courses. This will not only enrich the teaching of physics, the lively interest of the students will also be stimulated.

### *Creativity approach*

Creativity in the teaching of science has been considered significant for quite some time. There are slightly differing approaches regarding the technique that could be adopted to foster the creative endeavour. This endeavour may consist of :

- (i) developing ability to accept challenges,
- (ii) relating previously unrelated thing,

- (iii) making new patterns of materials, movements, words, symbols, ideas etc. and the product of the endeavour should be true, generalizable and surprising and should be satisfying to the individual himself,
- (iv) encouraging keen observation and ability to think and analyse a given situation

This will obviously require the teacher to show some creativity on his part as well and he will have to give up the alternative of falling back on habitual response. Creativity is a quality which each human being is expected to develop in his life

Teaching of physics provides one of the best areas for the full play of creative talents of an individual. The physics teacher who only 'lectures' makes the role of the students passive. They may listen to the lecture and perform some routine experiments and report the results in the usual way. It is difficult to nurture creativity amongst the students unless the teacher is adequately motivated to get himself actively involved in a creative effort. The specific type of endeavour has to be decided by the teacher himself, depending on the place of work, the facilities available in the school and its vicinity. Lack of facilities and resources has to be overcome and one can not afford to wait for the creation of such facilities. A physicist can take up any of the activities like setting up of new laboratory, thinking up new experiments, devising new ways of explaining ideas; popularizing physics, fabrication of working models, explaining basic principles, etc. Such a list can be extended by the teacher himself and in this the interaction with the students will be highly beneficial

and they can be involved as effective participants in new experiments and demonstrations. In routine experiments also, the teacher can bring out the creative faculties of the students. He has to decide the extent of freedom to be given to the pupil and has to ascertain that his students will not use a theostat without knowing the path and direction of the current flow, and that they really understand the constructional details of resistance boxes, galvanometers, etc. and that they will not fumble with the least count of Vernier callipers, screw gauge etc. Having achieved this once, the quantum of guidance required for fostering creative action will automatically get reduced and the student himself will be able to exercise his own discretion and judgement and achieve new results and correlations.

A familiar example can be quoted from magnetism in which the students are asked to "compare the magnetic moments of two magnets using Deflection Magnetometer and verify the Inverse Square Law". The students usually start the experiment by keeping the magnetometer in magnetic meridian and then they are told by the teacher as to how the magnet is to be kept on the arms of the magnetometer. The results reported are routine in nature and it is a common observation that most of the students perform the experiment taking the same values of the distances 5 cm, 10 cm, 15 cm, etc. Instead of this, the students can be given the magnetometer and the magnets and can be asked to find out the appropriate position for the magnetometer. The exercise involved will make the students realize the significance of the magnetic meridian. He can further be asked to study the variation of the angle with the change in distances

and study the nature of the graph between the two, to try various combinations and find out which of the combinations can give him a straight line graph and what interpretations can be made of this

Several other exercises can also be suggested in this case or in the case of Tangent Galvanometer. In setting up a laboratory problem to the student, one has to give emphasis to all the broad aspects rather than one specific aspect as is usually done.

### *Historical approach*

The names of great physicists are associated with 'constants', 'equations', 'effects' and 'experiments.' The name of Heisenberg is inalienably associated with his Uncertainty Principle, so well established in the modern physics. Davy and his safety lamp are known to us. Madam Curie and her discoveries have a permanent place in physics. However these and so many other names are correctly associated with their work but disconnected from the individuals and events which created the necessary situation and background for such monumental contributions. Science has a formal structure which can exist without the involvement of personalities. But is it really worth while to confine science only to current theories and their uses? Should not the students be familiarized with the creators and the creative efforts responsible for generating the current climate for change?

We should seriously consider the role of history of science in teaching of physics. It has greatly affected our culture. However, unfortunately, it has not been accepted as a part of the culture and is

still understood in terms of facts, rigid laws and generalizations which are not considered 'human'. This image of physics has resulted from the attitude of our schools. We have taught physics as facts, laws to be learned, problems to be solved. Physics is still a set of routine exercises in an ill-equipped laboratory aimed at verifying results which are already well known and values of which are available in the textbooks. This attitude needs a radical change.

The discovery of steam engine, laws of electromagnetic induction, aeroplane, laser, utilization of atomic energy have all contributed to the development of modern society. In fact, this has accelerated the change from the traditional to the modern, from obscurantism to rationalism. The history of the development in physics will also contribute to the development of a scientific outlook. The present day textbooks fail to familiarize our young boys and girls with the real structure of physics. This is hardly any introduction to the spirit, methods, and personal characteristic of physicists. The use of case histories has been attempted at some places to "assist the student in recapturing the experience of those who once participated in exciting events in scientific history". The basic aims in such studies or histories are to "know and feel at depth about the methods, procedures and techniques used and developed by the individuals in their work". Each story of progress and discovery put before the students in the proper form will highlight some aspects or the other and make him appreciate that science is the basic element of other subjects. Teaching physics through the historical development and in terms of physicists as people who are not different from the non-scientists will

provide an interaction of science, scientists and the society in its present day context.

It may be mentioned here that even at present, the history of development of physics or science in introducing the concepts of the subject is not a widely used technique and has been tried in limited cases. In our case, the teacher concerned will have to make his own efforts to proceed in this direction and incorporate the facts while teaching in the class. It is left for the experienced physics teacher and educationists to develop the necessary background for the development of this approach, based

on his classroom experience.

The points taken up for discussion here reflect the general feelings of physics teachers and the intention is to emphasize that the teacher has to break away from the traditional mode of teaching, making necessary adjustments and improvisations, depending upon the available resources. Such an approach will pave the path and give the necessary background for the new physics which will help the individual to play his role in the national development. The teacher has to accept this as a venture in self-sufficiency and will require courage and capability on his part. □

IN ANCIENT days two aviators procured to themselves wings. Daedalus flew safely through the middle air and was duly honoured on his landing. Icarus soared upwards to the sun till the wax melted which bound his wings and his flight ended in fiasco. In weighing their achievements, there is something to be said for Icarus. The classical authorities tell us that he was only "doing a stunt", but I prefer to think of him as the man who brought to light a serious constructional defect in the flying machine of his day. So, too, in science, cautious Daedalus will apply his theories where he feels confident they will safely go; but by his excesses of caution their hidden weaknesses remain undiscovered. Icarus will strain his theories to the breaking point till the weak points gape. For the mere adventure? Perhaps partly; that is human nature. But if he is destined not yet to reach the sun and solve finally the riddle of its constitution we may hope at least to learn from his journey some hints to build a better machine.

—SIR ARTHUR EDDINGTON, *Stars and Atoms*, 1927



# Piaget and Reorganization of Science Education at Primary Level

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*This article deals with a brief discussion of Piaget's theory of intellectual development. The emphasis is given to the pre-operational and concrete operational stages of development as these are the relevant stages at the primary level. The results of the discussion are utilized in suggesting a re-organised form of science education with special emphasis on child-centred activities.*

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THE OLD VALUES, traditions and aims are being replaced very fast due to rapid industrial and technological advancement all over the world. India is no exception to it. It has created an urge to train up the new generation so that they should be

able to shoulder the responsibility and contribute further towards the growth and development of modern society. This has made it imperative to review the kind of education our children are receiving in schools. And this led to a new wave of

curriculum development all over the world. A large number of new curriculum materials seem to have confused the teachers as well as the educational administrator. Even the curriculum developers in some cases became a little overenthusiastic and did not keep pace with the level of conceptual development of the children for whom the curricula were designed. One reason for this was also their own ignorance of the processes of thinking in children. It is only very recently that the educationists all over the world have started thinking seriously about the intellectual level of the children for whom they intend to develop the new curricula.

When one starts looking for information on the growth and development of the child he encounters with the works done by Piaget and his associates in this field. Though he is working with Genevan children for the last forty years, it is quite recently that the people in the U.S.A. and U.K. became interested in Piaget's theory and its implications in science education. A large number of replica and extension studies were conducted in these and some other countries. Some new curricula on the Piagetian concepts such as "Science 5/13" in England and "Science curriculum Improvement Study" and "Elementary Science Study" in the U.S.A. have been developed, tried out and evaluated in recent years. An excellent review of Piagetian works has been published by Sohan Modgil (1974).

#### *The processes of intellectual development in children*

The basic concept in these processes is the 'Concept of Schemes' Piaget defines it as, "Internalized mental behaviour of child". According to him, the

child develops certain kinds of actions or operations in his mental structure when his environment is changed. For instance, at the early infant stage, when the feeding bottle is brought near to his mouth, he starts sucking the nipple. This is ascribed to the scheme of sucking. Similarly, at this stage he develops schemes of looking, prehension, etc.

The basic processes in the intellectual development of children are *organisation* and *adaptation*. The child constantly organizes and re-organizes his actions and operations on the experiences from the environment, whereas at the same time he adapts to the environment by the process of assimilation and accommodation. As soon as a new scheme is developed in the child, he tries to use it in every new object and every new situation or event. The process of incorporating new objects or experiences into existing schemes, is called *assimilation*. When one tries to assimilate certain new experiences in the existing schemes, he also has to modify his schemes in order to accommodate the new experiences. This process of modifying the scheme in order to assimilate a new experience is called *accommodation*. The process of accommodation is complementary to the process of assimilation.

#### *Stages in cognitive growth*

Depending on the intellectual development of the child, Piaget classifies his growth in the following stages (Flavell 1963). The first stage is of little educational significance, the other three are described below.

(i) **PRE-LOGICAL OR PRE-OPERATIONAL STAGE** (from two to seven years) : During this stage the child is very much egocentric and his thoughts are highly intui-

tive and tied to perceptual arrangements. He cannot concentrate simultaneously on two aspects of any event and, therefore, the concepts of conservation, seriation and classification are not properly developed in them (Otaala 1973).

(ii) **CONCRETE OPERATIONAL STAGE** (from seven to eight and eleven to twelve years): At this stage an important development takes place in the child's thinking level. He is now able for the first time to form classes and series mentally. A marked decrease is observed in the egocentricity of the child, and an increase in genuine co-operation and discussion with others takes place at the same time. At this stage the child shows appreciation of the basic activities of closure, reversibility, associativity and identity. Piaget lists eight groupings of relationships which children learn during this stage. These are classification, seriation or order of succession, substitution or equivalence, symmetry, class inclusion, multiplication of series—one to many equivalence in classes and one to many equivalence in series. But all these operations are possible only at the concrete level, i.e. they can work only with concrete things. They are unable to imagine these relationships at symbolic form. As such, at this stage they can not hypothesize or make assumptions and argue on their basis (Unesco-Unicef Report, 1974).

(iii) **FORMAL OPERATIONAL STAGE** (from 12 to 13 years and onwards): At this stage the child no longer requires concrete objects to manipulate. He is quite capable now to think in abstract and play with symbols. He can hypothesize, design the apparatus to test hypothesis and make predictions on the basis of mathematical logic. He can interpret the data and draw necessary inferences from them.

These stages are basic in the intellec-

tual development of a child. According to Piaget, each child passes through these stages as he grows from birth to adulthood. But he makes it very clear that the ages at which the stages are likely to appear are only a rough estimate. This depends on the child, his environment and his social and cultural milieu (Athey and Rubadeau 1970).

#### SCIENCE EDUCATION ON PIAGETIAN STAGES OF DEVELOPMENT

The primary stage in our educational system starts with 5 and ends at 10. Thus, according to the Piagetian classification, these children are more or less at their concrete operational stage. This implies that they will learn more and better if given the opportunity to work with concrete materials to develop the concepts.

According to Duckworth (1964) good teaching involves the child's experimenting for himself, trying out things to see what happens, manipulating objects and symbols, comparing the findings he obtains on one occasion with those of other children, asking his own questions and finding his own answers. For Piaget, children must be allowed a maximum of activity on their part because they understand only that which they have found for themselves. This necessitates the children's working in small groups. Moreover, he points out that if the teacher attempts to teach too quickly the child may be prevented from finding out for himself, and concludes that there is no point in attempting to accelerate intellectual development in the child.

While discussing the mechanism of intellectual processes Lovell (1962) admits that

We do not yet understand the mystery of the human mind's strange faculty for perceiving analogies and formulating categories, and we cover our ignorance by coining words like 'insight' and 'intuition'. And our ignorance in this respect is likely to remain until there are advances in neurophysiology which enables us to have a better understanding of the physiological basis of the classifying mechanism.

Thus we find that the process of educating a young child is quite complicated and sometimes we do not know the precise cause of his learning whether it is through his stay in school, in home, with his peers or any other reason. Let us now have a look at the actual classroom teaching and try to suggest some new ways and means keeping in view the theory outlined above.

#### *Existing science teaching and suggestions to improve it*

The normal teaching procedure is one in which the teacher faces a class of 30 or 35 children (may be even 50 or 60 in some cases) and talks to them about science, languages, social sciences, etc. for a fixed time normally 30 to 35 minutes. This is necessary because the children need new information and the teacher is the source of all this information. But this technique, followed day after day and year after year, makes the children passive listeners and they become heavily dependent on the teacher and his dictated notes. Especially while teaching science, he need not follow this method always of course, occasionally it is needed. While teaching science classes he can group the children in twos, threes or fours per table and pro-

vide them with the tasks to work upon (Sharma 1974). Sometimes, these tasks may be the ones selected by the children themselves. All the pupils in a group may not necessarily be engaged in the same type of tasks. This type of teaching arrangement provides the children with opportunity to discuss their difficulties with one another and with the teacher. They are also free to get up from their seats to fetch apparatus or to seek further information. The atmosphere is quite informal to work, but the teacher is still a very important person because he provides the necessary guidance and direction for the work and helps whenever the child gets held up in the activity. He knows precisely the purpose of each task and arranges the necessary material needed for them. It is this type of classroom situation which is demanded by Piagetian theory because the children, though in the same class, are at different stages of intellectual development.

#### *Applicability in Indian situations*

This type of teaching is already in vogue in many developed countries like the U.K. and U.S.A., but it is quite an unfamiliar situation in most of the Indian Schools. This new technique will be very heavy both for the teachers and children because the teacher will have to prepare a large number of activities for pupils who are at different stages of intellectual development. At the same time pupils have to learn to work singly, in pairs or in smaller groups, discuss with teachers or peers and be much more responsible for their own actions. Therefore, before introducing this type of approach in primary schools in India, it will be appropriate to provide inservice training to primary school

teachers in which they may be exposed to the Piagetian thinking and some practical work with children on concepts of conservation, seriation, classification, etc. This training will help them to be aware of the needs of the children for different types of activities. They should convince themselves that children learn more by carrying out the activities themselves

To begin with, only one group of five or six children may be asked to work on some activities each day, while the rest of the class may work as usual. This group should be replaced by another the day next and so on. Thus all the 30 to 35 children will get an opportunity to work independently in small groups at least once a week. This slow and gradual move will give confidence to the teacher who is trying to move to a new and unfamiliar situation and adjust with it. The same is applicable to the children: they are being asked indirectly to work in a new system which they may resist, if hurried. When the teacher acquires enough experience, and children enjoy this type of work, he can work with two groups at the same time and slowly change the whole class into smaller groups and help them in learning.

Once a teacher can be seen at work along these lines, other staff members may become "infected" as usually happens in

such situations. However, it is necessary that the teachers themselves are convinced that the approach is good and the pupils, while learning better science, also enjoy 'doing' science.

### *Conclusions*

British curriculum project "Science 5/13" developed by the School Council assumes this type of approach and provides a number of ideas to teachers to work upon through the project materials. The whole project material is aimed at the teachers, which eventually benefit, the older pupils. The activities are classified according to the Piagetian stages. Similar approach has been adopted by the Science Curriculum Improvement Study Group and Elementary Science Study Groups in the U.S.A. In India, "Science is Doing" curriculum project was developed by the NCERT, and it has been adapted by various States in their primary schools. Though the spirit behind this project was a child-centred approach, little consideration was given to any psychological constructs. Therefore, the teaching-learning technique suggested in its teachers' guide and the actual situation prevailing in schools need reappraisal, especially in view of the new approach suggested in this paper. □

# The Physics Curriculum

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INERTIA is a property of matter. Matter resists motion. The greater the number of like-minded people, the greater is the force required for change. The purpose of this article is to make the masses move with time

Any educational system, it is said, must pass through four stages before it is fully evolved. They are (1) Maintenance of existing culture, (2) Economic development of the community, (3) Social development of the community, and (4) Development of the individual.

A particular stage of evolution also determines whether the curriculum should be content centred, society centred or pupil centred. India now is passing through the third stage of educational evolu-

tion. Accordingly, the Indian Education Commission (1964-66) has visualized education as an instrument of social transformation.

The knowledge explosion and difficulties experienced in its containment now determine the direction of the development of curriculum from *content* (facts, concepts, theories and generalizations) to *concepts* (concepts, theories and generalizations) and to *processes* (thought processes, ways in which problems are tackled, processes of scientific enquiry).

The school curriculum is geared to 10+2 structure. It demands a minimum programme of physics education to be a must for all. It must be socially relevant

and at the same time it must be of a preparatory nature for the degree courses, be it academic or vocational

For the social relevance, the catchment area for the content should be the Indian scene, immediate environment of the students and not the universe. The administrative and academic problems such as financial difficulty in providing separate teachers for separate disciplines, insufficiency of time for fully developing a concept require integration of physics with the other science disciplines like chemistry and biology. The integrated pattern help a student to see the unity of science. The division of science into three separate disciplines, requires one-third weightage of less than two periods per week to each discipline, which is considered to be inadequate for any discipline as a separate entity. It would also help in reducing the multiplicity of books, their cost and the load on the children

The basis of the course in view of the knowledge explosion has to be principles and processes which are relatively few in number. In addition, the following principles act as guidelines in designing a physics course

- (i) The school course should not be divided into classical and modern physics, it must begin on the classical foundations and give facts antagonistic to classical physics. For example, it must discuss the breakdown of the Newtonian mechanics at velocities approaching to that of light and the change of mass with velocity as given in special theory of relativity.
- (ii) The classical laws should be given in the light of modern physics. For example: a stationary charge is associated with an electrostatic field; when the charge is in motion it constitutes a current and is also associated with a magnetic field.

(iii) The course must be on experimental foundations. The understanding of the fundamentals should be through the fundamental experiments. Where the experiments cannot be shown, models be used, etc. For example: Galileo's experiments on falling bodies, Perrin's on Brownian Motion, Coulomb's on electrostatics, etc.

(iv) Only such laws and understandings be introduced which occur frequently in the whole course of physics. For example, work and energy, wave length, etc.

(v) The concepts which are difficult to explain be repeated at different stages. For example, mass and weight, potential, energy, etc

(vi) The concept must develop the main pedagogical principles—inductive and deductive—and explanations should emphasize that the macro events can be explained in terms of microscopical principles. The latter means that there are not only phenomenological laws but also the micro-mechanisms to be explained. For example, the kinetic theory can be used to explain the gas laws.

(vii) The polytechnical aspects of education should be introduced at appropriate places. For example, power generation by hydro stations, thermal stations, reactors, etc. The modern aspects are introduced through semiconductors, transistors, etc.

The processes are best developed through the above principles and the integrated pattern.

Problem-solving is recommended to be the best method for curriculum development. It provides motivation, teaching-learning situation, and makes the curriculum pupil-centred. In other words, it helps in realizing most of the objectives of education set forth by the educationists.

The course is recommended to be organized in the form of units. It helps (i) incorporation of topics such as nutrition in an integrated approach, (ii) breaking up of the course into semesters or part-time courses, (iii) identification of a core programme common for all the states, and (iv) periodic evaluation.

The practicals form an integral part of physics education. They must be open-ended to encourage resourcefulness, initiative and optimum use of resources.

The country has the tradition of 'cookery book' type of experiments, which has adversely affected the originality and creativity in children.

It is suggested that the practical classes should have two components (i) lectures by the teacher and (ii) experimentation by the pupils. The first is necessary for introducing the mechanism of the working of various measuring instruments. The maximum emphasis is to be laid on the development of skills in the use of the instrument and reporting i.e. accurate measurement and accurate reporting. The children should be made to realize that every measurement has some errors and

accordingly the reported result also has some errors which they should be able to correct.

The broad considerations above are for designing the physics curriculum. There are some specific considerations for different stages. In the primary (I-V), the content should be related to the child's immediate environment—it should be within his direct perception. In the middle stage (VI-VIII), we can come to the laboratory situations, introduce to first order and second order quantitative formulations of physical quantities such as length, time (first order) and velocity (second order, etc. At the high school stage, one can go from concrete to abstract, simple models can be introduced to explain the phenomenal world. In the +2 stage, a detailed explanation in terms of models such as the kinetic theory of gases can be used. In content, we should gradually pass on from the natural environment to the man-made environment such as industries, but always maintaining the relevance to the Indian situation.

Lastly, it is hoped that periodic evaluation would help in grade placements of the concepts in future. □



# Open-ended Experiments in Physics Teaching

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SCIENCE HAS NOT only become an integral part of social and political life of today but also its methods such as observation, recording, making models, experimentation, reasoning, drawing conclusions, etc. have become necessary for all disciplines. Science, therefore, has a special position in school curriculum.

The essential difference between science and other subjects such as humanities, social sciences, etc. is that in science the concepts are developed experimentally, i.e. all scientific hypotheses should have experimental evidence. The hypothesis will be dropped if the experi-

mental evidence do not support it. Science is not science unless it is accompanied by experimentation.

Physics is the prima donna of sciences. It encompasses the study of both the interior and exterior of matter, for example the study of nuclei, atoms, molecules and crystals, etc. It deals with the physical phenomena both at the micro and macro levels. Experimentation in physics is not only aimed at verifying the hypothesis and helping the children to understand the concepts better but it is also aimed at developing the following skills.

- (a) Acquisitive skills like observing, searching, gathering data, investigating and drawing conclusions.
- (b) Organizational skills like recording, classifying, comparing analysing and organising a project.
- (c) Manipulative skills like using instruments, repairing, construction and performing experiment.
- (d) Communicative skills like explanation, discussion, graphing and preparing reports
- (e) Creative skills like inventing, designing new apparatus, synthesising the data and planning ahead.

### *Classroom experiments today*

For long it was believed that students will learn physics best by repeating, in an abbreviated fashion, the classical experiments of Newton, Galileo, Hooke, and others. In this method the students could see the principles of physics at work and from their observations understand the physical laws. However in this the emphasis was on verification and demonstration of known physical principles. Little time or guidance was provided for tackling the problems for which solutions were unknown. The methods of physics were taught as procedural formula and the students believed that all problems could be solved in a routine manner. They had little experience in solving new problems. Besides, in this method the students perform experiments pertaining only to the concept developed by the teacher in the classroom. Nothing is left to the students imagination. Every bit of detail of the experiment, the methods of observation, presentation, the results and the conclusion are fixed.

In practice, what the children do are some controlled experiments. Out of the many variable factors in the experiment all but one are controlled. Children vary this one factor and confirm the hypothesis put forth in the class. For example, in the familiar experiment related to Ohm's law in electricity, the printed circuit is connected and the change in the current is noted when the potential difference is varied. Alternatively the potential difference is kept constant and change in the current is noted by changing the resistances in the resistance box. Little do they bother to know what happens when large voltages are used or when temperature is changed or when resistances are changed by using liquid columns, semi-conductors, gases, etc.

Physics is an ongoing enterprise. Old ideas are continuously refined and replaced. Formerly light was supposed to be made of particles which propagate in straight lines. Then it was said that light is a form of radiation which travels in waves. Now it is said that light is a form of radiation and its energy is transferred in packets. In physics new and exciting questions crop up and solutions are to be found. Physical ideas remain open for further exploration and experimentation.

The facts of today may be changed tomorrow. The facts and ideas about the nature of the interior of the earth may stand changed tomorrow. The ideas and theories about the planets and the universe are continuously changing. So it is obvious that stress has to be laid on the methods of obtaining the facts, on the knowledge and the skill required to develop and apply the methods. Well conceived ideas and established facts are not of primary importance in physics.

Highly limited experience like the one children get by doing controlled experiments block their development.

*Experiments based on inquiry and discovery approach*

In recent years, inquiry methods for teaching physics are being emphasized. Besides helping students to understand the physical concepts and to cultivate their scientific skills, such a method will help them develop the true scientific spirit when a student observes a phenomenon which he does not understand. He does not throw up his hands in despair, or ask someone to explain it. He learns to gather data, experiment, formulate and test the hypothesis. He analyses the intricate events into factors which can be examined in relation to each other. He learns to study the effect of one variable upon the other. He learns to control and predict events. He learns to go beyond the concrete situations to abstraction and generalization.

Earlier methods of doing physics experiments such as demonstration, reproduction of classical experiments and verification of known physical principles are now giving way to a method based on inquiry and experimentation. Suppose they have to study flow of current in an electric circuit. They will first explore few carefully selected science materials and instruments such as batteries, connecting wires, key, ammeter, voltmeter, etc. They will make a simple connection and observe deflections in the ammeter and voltmeter. The teacher will then suggest to them that the experiment demonstrates that when potential difference is applied across a conductor electrons flow through it. They will be then provid-

ed with additional materials such as different resistors, semi-conductors, valves, high voltage batteries, heating device, etc. They will play with these materials and vary the parameters depending on their background knowledge. They discover how far the concept is useful in different situations and get a better insight into the subject. In this method the children will have the same kind of experience as scientists have when they explore the unknown. They learn various processes and realize that these processes are only components of inquiry. They also come across some of the frustrations of things not working as they are supposed to and find out ways and means of overcoming these obstacles.

Experience and playing with apparatus becomes education only if the children reflect on them, relate them to similar experiences and generalize them. Reflection and generalization make the experience open-ended. These experiences lead into the future. They will make the children more curious and help them in their future studies.

While performing experiments according to the inquiry and discovery approach the children will set up their own experiments and follow their own procedures. They will then store the result using words, symbols and graphs, in a way they think best. On the basis of their previous knowledge they will carefully study the result. They will then form their own patterns, observe relationships, generalize and draw conclusions.

*Salient features of open-ended experiments*

Open-ended experiments emphasize enquiry and discovery approach. In this

the students' questions are met by further questions, thereby leading them to find the correct answers themselves. The teacher helps the students *to find the correct answers* rather than *giving them the correct answers*. He shares all the joys and frustrations of the children and goads them to new discoveries, new answers and new relationships.

In brief, the salient features of the open-ended experiments can be summarized as follows.

1. The area of investigation should be identified.
2. Children generally do not know the answer in the beginning but they should have a clear idea about the problem.
3. They should be acquainted with the apparatus and materials and should follow their own procedure.
4. They will make their own observations and record it in their own way.

5. They will interpret the result in their own way.
6. Each child or group should investigate the problem using different methods.
7. The explanation and generalization will be their own.
8. They would be able to suggest additional problems relating to the investigation.

The experiments may be quite simple for the teacher, but for the children they are new. The teacher will certainly be knowing the details of what the children are supposed to do but he should not disclose them to the children. The teacher has of course an important role to play. He should assess the children's background and accordingly help them to organise a particular investigation. He provides the setting on which the children discover something. He promotes the joy of discovery. □

# Physics for the Future

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WE LIVE in a world of invention and discovery. Atomic energy, space travel, supersonic flights, computers—all are applications of physics of our times. Yet how do we impress a lay man as to what physics is all about?

Here we have some samples of the posers.

Why does a star twinkle? Approximately where is the twinkling produced? Does a star change colour or move around because of the twinkling? Does it twinkle more in winter than in summer?

Why does a spinning top stay up? Some tops “sleep”, i.e. remain vertical, others process like mad. Some are always

steady in their motion, others waver before finally settling down to a steady motion. Some die long, lingering ‘deaths’, others depart rapidly. How do we account for these varied personalities of tops?

What causes the sonic booms produced by the supersonic aircrafts? Is the boom produced only when the plane first breaks the sound barrier? Does it depend on the engine noise? Does the boom depend on the aircraft’s attitude? Does it matter if the plane is climbing, diving or twinning? Under some circumstances the aircraft may generate a “superboom”—an especially intense shock wave. Under other conditions, a boom will be made

by the plane, but will never reach the ground. What probably happens to the boom?"

These are just a few of the situations that physics seeks to resolve. What is more, they tend to show that physics is not necessarily something abstract but touches problems that we face in every-day life.

Physics, as a scientific endeavour, has had a profound effect on life and society. The influence has usually taken two forms, viz ideological and technological. The development of the scientific attitude of questioning and the power to interpret and predict the natural and man-made events based on physical concepts, laws and principles has emancipated us from the superstitions of the past. For instance, we know for certain that the solar eclipse is not due to the "illness of the sun" nor for that matter the 'Barishal guns'\* are due to the wrath of gods.

It would be fair to say that some of the trends, conspicuous after man's landing on the moon, are likely to continue with increased vigour in the near future. In the field of space flight Pioneer-10 spacecraft is the first man-made object to leave the solar system. Indeed, the exploration of Jupiter by Pioneer-10 and 11 has greatly increased our knowledge. Recent data have revealed that there may be close similarities between the formation of the Jovian system and that of the solar system. However, further study in this direction is necessary for a better understanding of the solar system. With this end in view, Pioneer-11 has been targeted to reach Saturn at the end of the 1979. By 1978, the Mariner probe, with more sophisticated components than what

Pioneer had, will first fly Jupiter and then swing on to an orbit around Saturn and fly by the planet once again. It is expected that, among other things, much better photographs of both the planets will be obtained from the Mariner flybys. In the early 1980's an Orbiter may be placed around the Jupiter and then perhaps proper atmospheric probes will be made into the upper atmosphere of Jupiter. Even so these may only be exploratory efforts towards a complete understanding of the solar system.

The exploration of Mars by the orbiting, spacecraft as a prelude to landing has yielded a wealth of new knowledge about the configuration and structure of the planet Mars. The ideas that prevailed up to a decade ago ascribing to Mars many Earth-like features, have had to be radically revised. In general, the exploration of the planet Mars in the seventies by unmanned spacecrafts is likely to be of great scientific and aesthetic value. One of the great motivations for exploring Mars is the probability of finding life on its surface. In fact, this goal seems to be the fundamental scientific and philosophical basis for the continued exploration of Mars.

In a similar fashion, the probing of Venus is likely to gain momentum. Recent experiments have revealed the presence of helium in the atmosphere of Venus and ten times the Martian amount of atomic oxygen. Further experimental data are likely to provide valuable insight into the atmosphere, ionosphere and solar wind interaction zone at Venus. What is more, the study of the upper atmosphere of Venus may lead to an understanding of even more complex situation that obtains in our own atmosphere.

Another likely line of research in space physics would be concerned with further investigation of the properties of

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\*The thundering noise heard along the coastline of Barishal, a district on the southern seaboard of Bangladesh.

near and interplanetary space, 'moon research' observation of solar activity and the study of its effect on the processes in near space. Concurrently, the use of outer space for the practical tasks of improving communications, weather forecasting, geodesy, prospecting for minerals and mobilization of agriculture may also be taken up.

Having come down to the earth and with energy crisis still looming large, it would be a fair guess that energy research and development would occupy a top berth in international physics endeavours. Energy research may be broadly divided into discovering and developing new resources and using more efficiently those we already have. Two avenues promise future alternatives to oil -

- (a) development of thermonuclear energy of fusion power,
- (b) large scale use of non-nuclear technology such as solar energy, oil shale, geothermal power, conversion of coal to liquid and gaseous fuels.

Since the problem is so vital let us examine more closely the intricacies involved. We know that hydrogen bomb has many times the power of an atom bomb. It is therefore natural to expect the great promise of fusion power employing thermonuclear reaction. However, the trouble with the fusion reaction is that nobody knows how to make it slow enough and at a low enough temperature to keep it under control. The use of *pinch effect* and controlled *plasma* have been somewhat encouraging. However, much more study by way of physics research will be needed before we can hope to get useful work out of fusion.

Solar energy is very much the Cinderella of energy sources for the future. The use

of solar energy for cooking, melting and space heating is already feasible. Likewise the development and use of solar batteries is very encouraging. Nevertheless, large scale electricity generation will require the development of greatly improved materials, either for collecting and storing the sun rays more effectively or for constructing more efficient and much economical photo-electric devices. There is every reason to hope that active efforts towards these ends are likely to continue throughout the world.

As a natural extension of the petroleum fuel power, requisite technology would be developed for producing gasoline from oil shale and by turning coal into liquid fuel. Moreover, the economical use of alcohol in automobiles is also likely to receive due attention. Improved liquifaction and gassification techniques of coal is bound to make coal mining more human and environmentally acceptable.

One of the exciting possibilities that might be explored is the geothermal power wherein the natural volcanic heat may be used as source of power. There are promising sites in Italy, Sicily, Mexico, New-zealand, Iceland, Japan and Java. Another promising field that is likely to receive increased attention is the tidal power. All that is needed is a place on the coast where there is a high rise in tide. One has to dam off a natural bay or an artificial basin, so that at high tides the water has to run through turbines to flow into the basin, and at low tide it runs through them to flow out. In regions exposed to tides rising up to forty feet, it seems to be an attractive proposition to obtain electricity from seas and oceans. Since the world's supply of oil and coal are dwindling electricity from these sources will become so expensive that the tidal power plants may pay their way.

Considering the trends in basic physics in future, the claims of high energy physics seems fundamental. High energy physics seeks to understand the nature of matter in terms of particles and their interactions. The hopes and aims of the high energy physicists are to resolve the complexity of the universe in terms of groupings and interactions of some basic constituents. Indeed, they claim for the particles such qualities as colour, charm and even *gentleness*. Yet, there are many hidden mysteries to be unveiled and 'the proton structure and its hidden charm' is likely to be an exciting field. Another challenging field will be the physics of the liquid state. The liquid state physics

has long had the reputation of a kind of purgatory between the solid and the gaseous—region populated almost entirely by academics and the foolhardy when the keyword seemed to be 'interactability'. With the advent of computers and the growing advance in statistical mechanics there is a renewed hope of intense activity in this new and growing field.

Finally, the applications of physics such as lasers, computers and electronic devices are bound to play important and interesting roles in the fields of transport, communication, automation, health and music. We have every reason to hope for brighter future that physics will usher in. □



# Solar Energy

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ENERGY is the most important word in the study of physics. A famous scientist once described energy as the 'go' of things. It is derived from the Greek expressions *en*=in, and *ergon*=work (the relationship between work and energy is like that between money and a bank account. As the bank account is increased by depositing money, the energy of a body is increased by working on it). It means energy is the capacity for doing work. Flowing water has energy because it has the capacity for turning a water-wheel. The wind has energy because it has the capacity for turning the blades of a windmill. Energy is stored in wood, coal, petroleum and in atoms. It is stored in food and in our muscles. En-

ergy is important because without it the earth would be a motionless, dead world on which nothing could exist, a world without heat, light or sound.

We look for energy in two kinds of bodies : (a) those that are in motion (energy of motion), and (b) those under stress (energy of stress). The moving bodies spend their energy, on whatever they happen to hit and the stressed bodies store their energy and expend it when released from stress.

In addition to these two types of energy, there is a third form known as radiant energy. This energy exists in the form of waves which are given off by bodies which can be called radiators. The sun, for instance, is a radiator and

delivers an enormous amount of energy to the earth every day and this energy is known as the *solar energy*

Although modern man draws on many specific sources of energy, he like his primitive ancestors, is dependent on the sun, directly or indirectly, for nearly all the energy that he uses

On a clear day at noon, each acre of the earth's surface at the equator receives energy at the rate of more than 5000 horse-power. (Horse-power is a unit of mechanical power equal to doing work at the rate of 33,000 ft. lb. per min) If purchased at 30 paise per kilowatt-hour, this energy would cost more than one thousand rupees per hour.

After years of research, Dr. C. G. Abbott, former Secretary of the Smithsonian Institution, has determined that the upper part of our atmosphere is receiving energy from the sun at the rate of 1.94 calories per square centimetre per minute. This quantity is known as the *solar constant*. Out of this energy the earth's surface and atmosphere absorb 1.12 calories per square centimetre per minute and the remainder is reflected by the earth's atmosphere and the earth's surface

The energy received by the sun is held on the earth for varying lengths of time before it is lost back into the space. Wind and water power are direct results of the solar energy. Some of the sun's rays are absorbed by the earth's surface and a result of great convection currents cause winds which can propel ships and drive windmills. Some of the energy absorbed from the sun's rays is used in evaporating water. This energy is later released again as heat when the vapour condenses to form clouds and other precipitation and falls as rain. Rain, running down the side of hills and moun-

tains, may be used to turn water wheels or water turbines. Other quantities of solar energy are retained on earth for longer periods of time, since plants containing chlorophyll use it in the process of photosynthesis, making food to maintain animal life

Chlorophyll

Water + Carbon dioxide + Energy  $\longrightarrow$   
Sugar + Oxygen

Part of the energy stored millions of years ago in coal, natural gas and petroleum, is released now when we use them as fuel. This energy we expend at an ever-increasing rate to maintain our industrial civilization.

It is predicted that long before our coal is exhausted, practical use of the direct heat of the sun will be something commonplace. New devices, such as the solar battery, the solar lamp, the solar engine the solar furnace the solar still, and the solar space heater are being developed to convert a small fraction of the sun's radiation to usable energy. In solar batteries the current flows in the battery as the light strikes the emitter which is made up of a number of thin pieces of silicon, in the photoelectric cell. In solar lamps, the illumination is caused by ultra-violet rays. Since the ultra-violet rays destroy bacteria, these lamps are used by the physicians for sterilization, by the civic authorities for water purification system, and by food manufacturers for the preservation of food. In solar engines, the plan adopted is to concentrate the sun's rays by the use of large parabolic mirrors on a pipe containing water. The pipe serves as a steam boiler, and supplies steam to an engine. By focussing a concave search-light mirror at the sun, an extremely

high temperature is reached by the bodies place at the focus of the mirror where radiant energy becomes heat energy. This becomes an efficient solar furnace for testing metals

The solar still is used for converting the sea water into fresh water, by evaporating the water in large tanks by solar energy. The water vapour condenses on the transparent cover runs and down the sides of the cover into catch areas from which it is removed. Solar space heaters involve heating through embedded steam or hot-water pipes in the floor, walls or ceilings of the rooms to be heated. These warmed areas radiate wave energy to the people in the rooms so that they are warmed by the absorption while the atmosphere outside remains cool.

Solar energy is also used for propulsion in space in two ways. One is to focus solar energy by concave mirrors onto water which becomes steam and runs a turbine which, in its turn, spins a generator and produces electricity used in space propulsion. Another way for space propulsion is to use the pressure exerted by the sunlight when it falls upon an object.

Attempts have been made to store the sun's energy so that heat may be used when desired fig. 2. Such attempts have involved pans or coil of water exposed to the sun over as large an area as possible. When warm water is caused to circulate through the storage vessels containing chemicals (e.g. sodium decahydrate) which melt at this water temperature. The water can be warmed for domestic use by exposing blackened pipes under glass to the sun-light. This helps keep the house cool too.

We are indebted to Joule for the important scientific idea : the principle of

the "Conservation of Energy" which states that energy may be changed from one form to the other but it can never be created or destroyed. At least no one as yet has succeeded in doing so. During every transformation of energy, some fraction of the energy is lost. This lost energy usually takes the form of heat, which radiates out into the space. Therefore, the efficiency of any energy transformation is always less than 100 per cent

Until the discovery of nuclear reactions only a few decades ago, the source of the extravagant solar energy output was one of the greatest mysteries of science. The answer that first suggested itself was combustion, for fire was the only familiar source of energy that seemed at all comparable to the sun. But the combustion theory was found untenable. The sun is too hot to burn as burning implies the combination of other elements with oxygen to form compounds. But in the sun all the compounds are decomposed by the tremendous heat. Even if burning is chemically possible, the heat obtainable from the best fuels known would be hopelessly inadequate to maintain the sun's temperature, ( $20,000,000^{\circ}\text{C}$  at its centre)

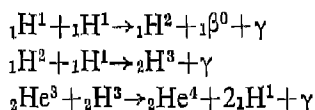
Another suggestion was made by Lord Kelvin late in the nineteenth century that the sun was shrinking, and as a result gravitational potential energy was being converted into heat. He showed that this process could keep the sun shining for only about fifty million years, a figure much too small to fit in with the geological ages of fossil bearing rocks.

The most recent theories of the source of solar energy are concerned with nuclear reaction. In such reactions enormous amount of energy is evolved. In such reactions mass could be converted to energy in two ways. If the heavy nuclei disintegrated to give a number of

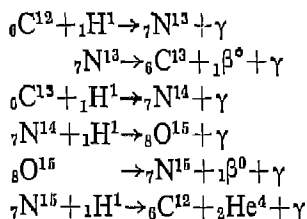
new nuclei of smaller total mass (fission reactions), the mass difference could be in the form of energy. And if several light nuclei could be united to give a new nucleus of smaller total mass (fusion reactions), again the mass difference might be in the form of energy.

The basic energy producing reaction inside the sun is the conversion of four hydrogen into one helium. This takes place both directly by the collision of protons, the hydrogen nuclei (proton-proton cycle) and indirectly by a series of steps beginning with hydrogen, ending with helium, and involving the common elements carbon, oxygen, and nitrogen (carbon cycle)

The proton cycle :



The carbon cycle .



For the entire process, by either cycle, the total mass of four hydrogen atoms is greater than that of the single helium atom. The surplus mass is converted into energy.

In 1905, Einstein stated his famous equation which expresses the quantitative

relationship between mass and energy. The equation is as follows :

$$E = mc^2$$

Where E is the quantity of energy in ergs (dyne-centimetres),  $m$  is the quantity of matter in grams and  $c$  is the velocity of light equal to  $3 \times 10^{10}$  cm per sec. If this relationship be true, then from 1 g of matter entirely converted into energy we should obtain  $1 \times (3 \times 10^{10})^2$ , or  $9 \times 10^{20}$  ergs or dyne-sec i.e.  $6 \times 10^{10}$  mile-tons (enough energy to lift 6 millions tons 1 mile into the air).

The relative probabilities of the carbon and proton-proton cycle depend upon temperature. In the sun and stars, which have interior temperature in the vicinity of  $20,000,000^\circ\text{C}$ , the proton-proton cycle predominates. The carbon cycle does not contribute much to the solar energy, because the temperature  $20,000,000^\circ\text{C}$  is too cool. Most of the energy of hotter stars comes from the carbon cycle, while in the cooler stars the proton-proton cycle is the chief energy source.

We can say that the sun is a huge atomic power plant which, through several reactions, changes hydrogen into helium and positrons, releasing large amounts of energy. The sun converts, 4,000,000 tons of its mass into energy every second, shooting huge incandescent clouds thousands of miles high. But so immense is the sun that in 150 million it will lose only 1/1000 of 1 per cent of its mass.  $\square$

# Non-formal Education: A strategy for the Universalization of Primary Education

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THE non-formal education is now the talk of the day. It is gradually consolidating its position as a parallel system throughout the world because of its high potentiality and operational advantages. In fact, such a system has been in vogue in all the developed and developing countries in the form of part-time or own-time education or on the job training as a means to life-long or continuing education of the adult. In a 'learning society' non-formal system is being given high priority. Recently the non-formal approach to schooling has been introduced in our country as a strategy for solving the prob-

lem of universalization of primary education. This system is supposed to offer opportunities to dropouts and non-attenders of the age-group 11-14 for multiple entry into the formal system at any of its stages for completing formal schooling within a shorter period of time. It also aims at providing a sound base for functional literacy and continuous education to those who do not want to move up the educational ladder.

Without going in the details of descriptive statistics of the quantitative development of primary education in our country in fulfilment of the directive

principle of our constitution one can say, without any fear of contradiction that our traditional efforts for the universalization of primary education for the age-group 6-14 have failed to yield the desired results and, consequently, a large number of our children, belonging mainly to the economically and socially disadvantaged groups, have remained outside the school.

There are many reasons for this sad state of affairs. One of the main reasons is poverty. Removal of poverty and for that matter modernization of our traditional society depend largely on human resource development and economic growth. Economic growth, again, is closely associated with the changes in the attitude-behaviour complex of the people, for 'economic practice is inseparable from culture and psychology'. "The modernization process involves shifts in learning style, time organization, perception of the social context and the natural world, notions of progress and mobility, alterations of internalized reward structures, acceptance of new ideas and so on (Marvin Grandstaff). Economic development and improved standards of education are closely linked. One cannot proceed very far without the other. Illiteracy and inappropriate education seriously retard modernization and development. Removal of illiteracy and for that matter universalization of primary education and development-oriented education are, therefore, our urgent needs. As a development strategy there has to be a systematic effort to create, out of the traditional peasant population, an effective modern work force for the farm as well as for the factory. The primary schooling stage provides the potential work-force not only for the economic growth and removal of poverty but also for the sustenance of our democracy on a sound and strong

footing. It is, therefore, imperative that we quicken the process of universalization by introducing a development and work-oriented education. The non-formal approach is considered to be one of the ways for fulfilling this task.

#### WHAT IS NON-FORMAL EDUCATION ?

The potential field of non-formal education is so vast that it is difficult to articulate a single definition suited to all operational situations. Unlike formal education, non-formal education has no single base which may help in its conceptualization.

'Non-formal education' is, of course, a negative descriptor—it is an education which is not given in the formal way, even though it is imparted in a systematic way as against the 'informal' way, where all learnings are incidental and casual and, therefore, mostly unsystematized. Non-formal education usually indicates education that is 'non-school'. We now, therefore, have non-formal centres and not schools. Non-formal approach is mainly focussed on adult needs. But the idea has been extended to primary education with the hope that non-formal schooling will help children of particular sections of the community to complete formal education in a shorter period of time in a more meaningful and purposive way. Once Vinoba Bhave gave the concept of one-hour school and on-the-job schooling for the rural child who cannot come to schools for a full-time formal schooling. He suggested that the school should go out to the field where children are helping their parents in farming. The idea, which comes closer to the non-formal concept, was not however seriously examined by our administrators and plan-

ners. However without entering into further discussion on the complexity or diversity of a definitive concept we may accept a definition given by Kleis, Lang and others, as it can be operationally perceived. It is as follows :

The non-formal education is any intentional and systematic educational enterprise (usually outside traditional schooling) in which content, media, time units, admission criteria, staff, facilities and other system components are selected and/or adapted for particular students, populations or situations in order to maximize attainment of the learning mission and minimize maintenance constraints of the system.

From an analysis of this definitive construct we may conclude that non-formal education will have the following characteristics :

1. Non-formal education, unlike informal education, is intentional and systematic and not incidental. It is a deliberately planned educational effort having goals and definite programmes
2. The goals of non-formal education and formal education may be different but in reality both attempt to do the same thing from different perspectives. Both try to increase personal and national productivity. Non-formal education is more responsive to the needs of 'relevant' education and offers a flexible programme as against the rigid formal system with its time bound programme. Non-formal education may also prepare an individual for entry in to the formal system at any point in its organization.
3. Non-formal education is usually concerned with immediate and practical missions and it is mostly utilitarian in character rather than 'education' in its holistic or philosophic sense.
4. It usually takes place outside the schools. Any situation which provides appropriate experiences may be employed as the learning site.
5. Outcome of learning is judged by performance rather than by certificate
6. It usually does not involve highly organized content, staff and structure. Although facilities may be shared with the formal system non-formal efforts are outside the formalized, hierarchical structure of the graded school system
7. It depends on voluntary participation of the student. It is usually part-time and own-time activity of the learner.
8. Instruction adopts a flexible approach and is adapted to learner's needs. It tends to be work-or job-oriented or even work-centred
9. It is less than the formal system and attempts to maximise learning within a minimum period of student time.
10. It may not involve customary admission criteria. Potential students are those who require the available learning or who are required by the situation to have it

#### WHY NON-FORMAL EDUCATION ?

Although the non-formal schooling cannot and should not replace formal education, it has its own significance

particularly in view of the fact that the school is by its own nature a cloistered situation, functioning, by and large, in isolation from the needs of a developing society. In fact, the supposition that non-formal education can compete with the formal counterpart is unwarranted, at least so long as the latter continues to cater to the needs of the elitist group with its status symbols, namely, degrees, diplomas and certificates which are 'pass-ports' for entry into jobs. In these days of explosion of knowledge and innovations and ever-changing technical know-hows, the work-force has to remain up-to-date. People cannot be involved in continuing education more economically than in the non-formal way. Moreover the schools cannot perform all the educational functions that are important to life, while the non-formal procedures can respond satisfactorily to the objectives to which the formal school is ill-equipped to respond. One may learn the techniques of a job, but what it is like, what it means to do a job in a real working situation, can only be learned in all its dimensions by doing it in a natural setting. Work-experience or work education as an integral component of the school curriculum may meet this deficiency of the formal system, but the non-formal education would seem to have better relevance, because in the non-formal education all education centres round the work or development situation requiring participation of the learner for the fullest realization of the objectives.

The demand for education is growing fast along with the phenomenal increase in population and growing aspirations. It is also important to notice that the demand is not so much for 'education' in its broader concept, as Phillip Coombs in his book *The World Educational Crisis*

rightly points out, but for 'schooling', since degrees, diplomas and school-leaving certificates are more valuable as currency than knowledge *per se*. The cost pressure puts up restraints to this demand, as the formal schools are rather expensive to operate. As a result there is educational deprivation and consequent social injustice. The non-formal arrangement is relatively less costly, as it depends largely on local resources. Then again all formal schooling systems are sequential in character and their duration is long. This long sequence in the formal structure together with its elite-producing characteristic with little relevance to life's needs is responsible for heavy dropouts and failures. Stagnation and consequent wastage result in total loss, both in terms of investment of the student's time and expenditure—a loss which a poor country like ours can ill afford. Furthermore, research reveals that for every student who completes a sequential programme, the investment of student time is more than double the years actually required for the programme. All sequential programmes show some wastage. All these evidences make a strong case for a non-formal system at least for those who cannot take advantage of the formal system.

The non-formal education focusses on practical, functional and often work and job-oriented instruction. The emphasis is on the immediate use of education. Its content is to be determined by the identified student needs, the structure of their previous experience and environmental conditions of each individual student. This approach responds satisfactorily to the cry of the masses for useful education and, therefore, it is likely to solve the problem of motivation. It is gratifying to note that the formal educational model is also tending to have practical and job-



oriented modules, tending to become less rigid and is patterning its approach to the non-formal model. But because of its long sequence it may take one or two more decades to appeal to the masses.

#### CHALLENGES OF NON-FORMAL EDUCATION

The non-formal education at the primary stage has two major tasks. One, the children of the age group 11-14 have to be so 'schooled' that they fit into a stage of the formal system of their choice for completion of the formal education up to the school stage or even beyond according to their level of aspirations and the second task is to help those children, who do not want to move up, to function as effective citizens. Both the tasks are challenging, because they involve adoption of a new technology of curriculum-making and curriculum renewal and teaching methods. An integration of disciplinary and utilitarian approaches to curriculum construction and teaching is essential. The cognitive-affective-psychomotor skills related to communication, work efficiency, healthful living, relationship of science with life and living, knowledge of environment, in short, the fundamentals of knowledge, attitudes and skills that contribute towards better human living would constitute the ingredients of a functional and experience-based curriculum.

The major responsibility of the teacher consists in looking out for alternatives and innovations and the appropriate teaching methods that hasten the learning process and promote self-learning at the same time. He must not only be committed to his task but have the needed competency to locate learning abilities and disabilities of the culturally deprived the

first generation learners who will constitute the bulk of the student population under the non-formal system, at least for the next decade or so and to identify their life needs. He would also need to have the competency to develop integrated learning programmes having close relationship with productive work, occupations and the environment. He must know how to maximize learnings with the meagre resources that lie around or are made available to him. The teacher's role is thus crucial to the success of the enterprise. It will be successful to the extent specific teacher competencies are developed.

Gunnar Myrdall has come to the conclusion after a brilliant analysis of what is happening in the developing countries in the sphere of education. He says, "what they (under-developed countries) need to do is not simply to add more education to what they are now offering their people but to change in a fundamental way the whole structure, direction and content of their educational system." The non-formal approach is probably one of the ways for solving our problems of primary education although it cannot be considered as panacea of all ills and inadequacies, nor should it be considered as a compromise. It is a system in its own right. If the strategy yields results as are expected, it will solve at least one problem and that is the problem of cost. But it will be necessary to proceed cautiously. It will be too dangerous to implement the idea on a large-scale at once without preparing the teachers and without waiting for the results of the pilot experiments. A good deal of research, systematic experimentation and evaluation and constant feedback should enter into curriculum making, teaching methodology, preparation of curriculum materials and

teacher orientation should enter into the initial experimental phase. In this country during the post-independence era we have rejected many good ideas in the field of education without giving them a fair and systematic trial. The non-formal education, as we have seen, starts with the

felt needs of the people, it helps in raising their aspiration level, it promotes their vertical mobility and in so doing it helps the nation to develop. It has, therefore, great promise. Let it not have the fate of a still born baby

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# Improving Dimensions and Effectiveness of Community Participation in the Educational Decisions in Rural India

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INDIA is primarily a land of villages and a country of communities. Thus, despite the many large metropolitan cities, 70 per cent of the population of India is found living in villages. Most of the recent educational movements centre around the needs of cities and urban schools. Thus, it would appear that recent curricular developments overlook the special needs of the rural people, i.e. of most Indians.

Answer to the following questions will probably confirm this apprehension; What is today's student in rural high schools supposed to learn? What are they actually learning? What does the study of high

school subjects contribute to secondary students' educational developments besides facts, concepts and generalizations? Any skills? Any values?

One does not have to make a prolonged and close examination of the high schools to become aware of, appreciate, the need for reconstruction of the rural school system. It is so obvious. In order to make any constructive changes in our high schools especially in rural areas, the schools should help the children to be conversant with the problems of their daily life and train them to strive to contribute as effectively as they can in finding solu-

tions to these when they are grown-up citizens

The present weakness in our school system is that the people do not look upon the school as one of their institutions. It is looked upon as some thing remote although useful. Many do not know how they can reform it even if they desired.

Thus, one burning issue in education in modern India is how our communities should be involved in the education of their children. In order to understand the problem of community involvement in the school system, it would be desirable to discuss briefly community power structure vis-a-vis decision making in education.

#### *Role of community power structure in education processes*

Power is the ability of individuals or groups to determine the behaviour of others, even against their wishes. The structure of power within a community refers to the relationship between individuals or groups holding power.

The network of this relationship will naturally determine what is called the 'politics of education' which in its turn proves, often to the chagrin of educationists' papers, a most potent influence in educational decision. In a way it cushions sudden and major educational changes which necessarily have to be tailored to the local and real, even if parochial, needs. This diversification which caters to diverse interests ensures cooperation from people who matter. Community power structure refers to power relations or patterns of influence in the community which may be the determining influence on the school or have only an "advisory capacity"

sometimes. Influencing the change in the rural high school through the community power structure itself is sometimes a Herculean undertaking; but recent studies on community structure suggest that it is not impossible. The school system is a sub-system of the community power structure. There exists a line of communication between the school system and the community structure. State Department of Education officials, school administrators and teachers can, and indeed must, initiate and influence change through the community power structure in India. Indeed in the democratic set-up it is inevitable.

#### *Strategies for change*

To utilize the power structure in order to bring about desired educational changes, the educators and administrators need to develop strategies which will

- (i) promote the adoption of educational change through the community resource groups or local advisory committees and existing political system in a community
- (ii) produce a change in the structural process of the system itself to make it open to educational change.

In rural India this can be brought about by the utilization of local advisory committees and the village political structure.

Local community resource groups may comprise individuals and organizations in the village who want to help the educational programme in the schools of their community.

These committees might include retired teachers, civil servants, professional people and people who are directly, indirectly as officials or parents, concerned with and/or interested in educational issues and problems. It will ensure public involvement in the schools and the establishment of community schools.

It would be worthwhile to delve upon the term Local Advisory Committee, which may be conceived as a group of local community people whose function is to advise the state departments of education in India concerning the desired directions in the local school should take regarding curricular or non-curricular school matters. In order to make sure of the wholesome impact of local advisory committees on educational concerns of the community, the advantages, the organisation, functions, and intent of local advisory committees in school matters may be examined.

#### *Advantages of the local advisory committee*

- (i) It enhances public awareness of the school system.
- (ii) It improves the quality and relevance of education to the community.
- (iii) It transforms schools into miniature communities.
- (iv) It brings the school out of its isolation and dovetails it with important aspects of community life.
- (v) It provides a climate which facilitates educational innovations.

The stereotype of the present-day Indian society as dormant, static and impervious to social, economic, and scientific changes is highly misleading.

In spite of colossal illiteracy people have, what may be called, the wisdom of the ages. They are cautious and not dazzled by appearance. Also, because of their well tried, time honoured, even if primitive, way of doing things, they are like to make sure the new ways will work. It is not statism but concern for security which determines their attitude to change. They all want modern education for their children; but to them modern means new, not novel.

If we want to impart meaningful education to the children and youths of India, to help them meet a variety of needs felt in any changing society, especially one known for diversities, the school system should invite the opinion of the community members to win their support for enriching the quality of educational services. The above approach increases public understanding of the school and also improves the quality and relevance of education to the community needs.

If the school curriculum remains as theoretical as it is at present and does not cater to the needs of the local community, it will fail to get any support, much less enthusiastic support, from the local community. This conviction leads us to suggest that our first step should be to transform schools into miniature communities. This can be accomplished effectively by the utilization of local community resource groups or local advisory groups. In this connection, State Department of Education, school administrators and teachers have civic responsibilities in cooperation with other citizens to harness the existing power.

Structure for the creation of a climate which facilitates educational innovations. Educational development in traditional societies often materially disturbs the existing power structure and the relation-

ship between the haves and have-nots. This may be the starting point of a controversy. The question is if the existing power structure is not amenable to influence, guidance, prodding, persuasion, etc. what other means, and to what extent, should be employed to remove indifference or resistance to change. Obviously, in this context, as about the political system and set-up in general, decisive factors will be enlightenment and political maturity of the people, the quality of leadership and its relation with the mass of the people, the political philosophy, the economic conditions, and social harmony, etc.

In the past years, even in developed countries like the United States, Canada and Britain, educators felt constrained sometimes to use techniques which were based primarily upon persuasion for promoting educational changes in the communities. Many educators found even this inadequate. A new technique (progressive but not coercive in nature) can be considered, or found necessary to bring about a change in some traditional societies. Legislation takes on where persuasion and advice fail. Educational research conducted by the Institute of Administrative Research, Teachers College, Columbia University under the direction of Dr. William S. Vincent in 1968, points out to similar conclusions.

#### *The purpose and organization of local advisory committees*

Local Advisory Committees are established primarily to assist the Department of Education gathering relevant information pertaining to the school problems. Their duties and functions should be advisory rather than decision-

making. Their purpose is to assist the school and department officials in the local school decision-making processes. The meaning of the word "advisory" should be made very close to the local advisory committee in order to avoid any possible future conflict regarding their limits of influence and power. This approach should inform the relationship the Department of Education officials (inspector of schools), principals, headmasters, teachers and other citizens in the community.

In order to forestall misunderstanding it would be advisable for the Department of Education to make a statement of policy regarding the "power" and "advisory" nature of the local advisory committee. Also the following information should be included in the statement :

1. Purpose of the committee
2. Size of the committee (number of members in the committee)
3. Duration
4. Mode of selection of members
5. Mode of replacing members whose term expires
6. Method of communication between the local advisory committee and Department of Education
7. Nature of "advice" to be rendered by the committee to the Department of Education
8. Evaluation of the effectiveness of the committee.

Needless to say, all advisory committees will not function identically, nor wield the same influence.

#### *Types of local advisory committee*

There may be two types of Local Advisory Committee

- (a) Short-term Local Advisory Committee (i.e. specific problem shooting committee).
- (b) Long-term Local Advisory Committee (i.e. Long-range Committee)

(a) *Short-term Local Advisory Committee.* The short-term local advisory committee is commonly found in the most affluent nations. This type of committee is established to assist in solving immediate and short-term problems such as adult education, school building, safety regulations and truancy problems etc. The term of this committee is usually from two to six months. Some educators believe that this type of committee is most effective and productive since the members of this committee are given a specific responsibility.

(b) *Long-term Committee.* Long-term committees are appointed for a long period of time such as 2-3 years to assist the Department of Education in planning and carrying out school programmes with a view to producing citizens who will not only be the educated citizens but will also leave the educational provision better than then they found it. They will also help after leaving schools, devising of problem oriented educational programmes. These committees can prove more effective due to their long-term contacts with the school problems.

#### *Organization of the committee*

Regarding the organization and power structure of the local advisory committees, the following information is desirable.

- (i) Procedure for selection of the local advisory committee;

- (ii) Membership (Rules and Regulations);
- (iii) Frequency and minutes of meetings,
- (iv) Implementation of the recommendation and the findings of the committee by the Department of education.
- (v) Evaluation of the impact of the committee.

#### *Procedure for selection of the committee members*

- (i) Appointment by the Department of education
- (ii) Selection by the Panchayat (Village Council)
- (iii) Selection by community organizations represented on the committee
- (iv) Appointment by the Minister of Education after nomination by various community groups and village council
- (v) Combinations of the above

The selection of the committee will have to be made in a variety of ways but it should aim at a true representation of the cross-section of the local community.

Equal opportunities should be provided as far as possible to all community members irrespective of the religion, caste, creed, political and economic considerations, although in a country of India's size and diversities such equalization, will present enormous problems in the foreseeable future. Liaison between these committees and the Department of Education should be deliberate, even obtrusive, to make the membership of such committees prestigious and to accord

them an official, at least a semi-official, status.

*Committee membership.* It may indeed prove a Herculean task to form rural committees which are truly representative of the community. The effectiveness of the committee depends upon the characteristics of the members. It is true that individuals from the lower incomes section may not actively participate in the local advisory committee. There is a likelihood that nominations for the local advisory committee may probably not truly represent the community. People on a local advisory committee should represent the feeling of the community regarding educational problems and issues, not their own opinions or those of organizations to which they belong. The young as well as the old should have representation on the committees. Teachers will inevitably be involved in these committees, but they need not outnumber the non-teacher members in the local advisory committee. The principal/headmaster and the inspector of schools should be the *ex officio* members of the local advisory committee without the right to vote.

#### *Qualifications of the committee members*

1. Civil servants with a sound educational philosophy
2. Retired teachers
3. Professionals
4. High school teachers
5. Interest in education and leadership qualities with a good reputation in the community.

*Selection of committee officers.* It may be advisable to organize the local advisory committee and elect the President,

Vice-President and Secretary of the committee. It may be helpful to have a non-professional with a good reputation in the committee. He may feel the pulse of the community better.

*Evaluation of the committee's effectiveness.* Provision should be made for the evaluation of the performance of the committee. The Department of Education should be associated with this evaluation in one way or other.

#### *Role of panchayat in educational decisions in present-day India*

In rural India, where after all most such committees will be functioning, it is inconceivable that the committees should be set up in isolation from what are known as village panchayats. A panchayat literally means a committee of punch or five. The number is not sacrosanct in modern times and depends upon the size of the population. The village panchayats in India had their origin in pre-historical times, and in spite of ups and downs have had an uninterrupted existence, even in the most centralized and imperialistic administration a village panchayat was the decision-making authority, practically in all matters of vital importance to the village community, and all people, rich and poor, could have their grievances considered, at least through the village elders to whom they had easy access.

These village panchayats have been activated in very recent times, their functioning extended and put on modern lines. The village panchayats with the help of coopted members where necessary can function as advisory committees. In some cases forming of bigger educational units comprising three or four villages may be



necessary for dealth of persons competent to sit on advisory committee

ment by objective process is the periodic, joint review of the results.

### *Some practical suggestions for local advisory committees*

*Management by objectives.* As pointed out earlier, influencing the change process especially in educational endeavour through the community power structure is sometimes an enormous task. However, recent studies of community power system suggest that management by objectives technique may be helpful in the above undertaking

This is not simply an apparatus for making technical decisions but rather a personnel management and evaluation tool. Operating within the parameters of McGregor's Theory Y, management by objectives has the following five steps

STEP 1. The first step is intended to establish with the role expectations are. Pertaining to the community resource group this step implies determination of the fundamental needs of the community.

STEP 2. The second step is for each subordinate to identify his individual job goals. These are stated in terms of organizations over all goals, i.e. goals are developed on the basis of identified needs in Step 1.

STEP 3. The critical third step is an organization for conference between the manager and each of his subordinates to establish agreement on those individual goals. This is a critical and subtle function. This step with reference to local advisory committee implies breaking down each goal into more specific sub-goals.

STEP 4. The fourth step is to establish objective standards for measuring good achievement.

STEP 5. The fifth step in the manage-

### *Other suggestions*

1. Local advisory committee should be clearly aware of national interests while making decisions.
2. The resource community group should have a thorough knowledge of the local environment needs, problems and economic conditions.
3. The committee should demonstrate competence in providing leadership in rural communities.
4. The committee should have the ability to work with individuals and organizations having diametrically opposed views in a genuinely democratic and cooperative manner.
5. The committee should have a sound educational policy which is concerned with local needs but is aware of national interests.

The committee should have clear methods of communications.

The following suggestions may also be helpful :

- (a) Map the local community area pointing out agricultural, industrial, educational, and health resources.
- (b) Make detailed study of the local needs, problems and type of education desired by the local community.
- (c) Invite the community's opinion regarding the local educational needs, local ambition and values.
- (d) Organise parent teachers' asso-

ciation if it is not already established.

- (e) Investigate community resources which may be utilized as a rich source of teaching materials in the school. This material might include field trips, resource people and audio-visual material

### *Community-centered education programme*

The most common criticism against community participation in the educational decisions (especially local advisory committees) is that the members of the committee may not be competent to assume the responsibility.

In order to mitigate the above criticism, the following detailed plan (or training programme) to familiarize the village council members, community resource groups and village level workers with educational processes is suggested. This may provide local support for educational change, and train local resource persons to aid the local school in its educational programmes. This has important ramifications for both in-service pre-service teacher education.

### *Overview of the proposed community-centered education programme*

- 1 TRAINING OF VILLAGE COMMUNITY MEMBERS (SUCH AS VILLAGE COUNCIL MEMBERS—PANCHAYAT AND VILLAGE LEVEL WORKERS) IN VARIOUS EDUCATIONAL PROCESSES IN ORDER TO BRING A CHANGE IN EDUCATIONAL SYSTEM IN RURAL HIGH SCHOOLS

India is a country where most persons act as members of communities rather than individuals. It is these communities with which the state, in orthodox Indian view, should deal. In every village there

is an elected panchayat which is incharge of all development programmes in the area. It provides the medium and link through which the village people express themselves on the administrative, social educational and economic problems of the country.

The school system is a sub-system of the community power structure. As such, the school system interacts with and exchanges matter, human energy and information with the community system. Teachers in rural India can enlist the help of panchayat (village council) and village level workers. The panchayat and village level workers can use their position to improve dimensions and effectiveness of citizen participation in the educational decisions. A group of teachers in different villages combined with effective political leadership can produce a significant impact upon the community to bring a change in curriculum in high school subjects.

In order to achieve the above aim, i.e. to provide responsibility for leadership to the village council, a training programme should be developed to acquaint the community members with various educational process in order to bring a change in the educational system in rural India through power structure.

### *Overview of the proposed course content for training of village community members.*

(Certification Level: 3-month duration)

#### *Section A (Theory and Discussion)*

- (i) Community Needs;
- (ii) Community Control of schools;
- (iii) Function organisation of Local Advisory committee,

(iv) Functions of the State Department of Education

*Section B*

SEMINAR I OR WORKSHOP I. Discussion between the Department of Education and village community members (under-training) concerning the various aspects of education with a particular reference to the community level.

SEMINAR II OR WORKSHOP II Discussion between Headmasters/Principals (under training) concerning educational innovations and other related matters.

SEMINAR III OR WORKSHOP III. Discussion between faculty of education (teachers' training college included) and village community members regarding educational changes.

SEMINAR IV OR WORKSHOP IV. Exchange of views on various educational matters among all the above participants i.e. the Department of Education, principal/teachers, faculty of education and village community members. In this seminar or workshop some definite recommendations should be made for improving the present system of education.

*Teacher education for rural India*

Even a cursory glance at the teacher training programmes in Indian colleges of education will show that most of the would-be teachers of rural India are being trained in city centres. The proposal to educate these pupil-teachers about the role of advisory committees, their organization, functions, etc., is neither fanciful nor premature. The programmes for pupil teachers would prove unrealistic if the teacher-educators remain as ignorant about schools in the country side as they are. Now that the means of transport,

the rail road system, etc. are developing fast, there is a great scope for increasing contacts in between and far more visits to village schools teachers on one side and the senior staff in colleges of education on the other. The teacher-educators as part of extension services should take a lead in organizing advisory committees in rural areas with the help of their alumni, who may be teaching in village school. Senior students in the Department of Education may be encouraged to take up research investigations in the functioning of advisory committees, their problems, etc.

### CONCLUSION

Community participation in educational decisions in the remote past was inconceivable. Education was for a few, and whatever it was it had a religious bias. It was only remotely concerned with the everyday life of the common-man. Nor is community participation in educational decision desired or even permitted in a dictatorial regime. But in an age of mass education and for the success of a democratic set up it is essential, especially if educational system and plans are to be fruitfully implemented, the new education has to be sold to the people. These educational advisory committees to be organised through out the country, rural as well as urban areas, can do. But these will be successful if they are associated not only at the stage of implementation of plans and scheme but also directly, or indirectly, at the stage of formulation.

Educational reforms nearly always come from the specialists. But these prove unrealistic when they are wholly informed by idealism and not tempered by down to earth commonsense or realism.

Association of lay opinion will provide the much needed corrective. Educationists proper are too much concerned with academic aspects only. Notwithstanding what is usually said about education as an end in itself or about terminal stages, the fact is that education at each stage remains preparation for the higher stage. The educationists have their vested interests. They deliberately, or unconsciously, push up their own specialisation. The courses of study often are out dated. At the same time there is a real danger of too much interference from the non-educationists in education. It has been rightly observed by some that those who know least about education do most sermonising about education. If advisory bodies are exclusively formed by, or even dominated by, political leaders, businessmen, industrialist, etc. then the vocational or the utilitarian interests are likely to displace other important, even though less tangible, objectives. The teachers and educationists appreciate the latter.

In the organization and functioning of advisory bodies a proper balance has to be maintained. □

# Physics in Medicine

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IN UNDERSTANDING the life sciences in terms of physical laws, many powerful techniques of the physical sciences have been successfully applied. Though this goal has not been achieved fully due to the complexities of biological processes, their results, so far obtained, definitely indicate the correctness of approach. As an outcome of these studies, many physical techniques have emerged, which are useful in the clinic for diagnosis as well as therapy. With technological development, new devices are replacing the old ones. In this article we shall indicate a few of these along with a general survey of the application of different branches of physics in the clinic. Since all the

branches cannot be covered, a few indicative branches are summarized below. Also, instead of describing the applications in detail, they have been mentioned along with suitable references

## *Radiation in general and its application*

There are many types of radiations in physics, and their interactions with matter are now known to a good extent. Usually, when these radiations, which are electromagnetic in nature, are passed through matter, energy is given to the matter. The energy imparted is a characteristic of radiation as well as of

matter. In a sense, even a stream of particles is called radiation. For example, a stream of electrons is called Beta radiation, a stream of protons is called proton radiation and so on. Radiations of different wave-lengths are used in the clinic for different purposes. For example, X-ray ( $\approx 1$  MeV) is used for inactivating the unwanted cells, X-rays ( $\approx 0.1$  MeV) for taking photographs of X-ray opaque objects (many times one has to inject some opaque dyes to get the photographs of the organs), ultra violet ( $\approx 6$  eV) for various treatments, visible ( $\approx 2$  eV) for various photo-chemical processes and infra red ( $\approx 1$  eV) for diathermy. The effective energy given by high energy radiations are calculated by a procedure known as dosimetry. Thus, depending upon the purpose, the various doses have been fixed for various types of radiation. The real problem comes when one has to give a particular dose to an organ, which is not situated on the surface, without damaging the tissues in the path. No real solution exists for this problem, but unwanted effects could be minimized by using proper radiations. For example, Beta rays, could be used for a surface dose, or proton beam could be used to some depths, as the proton loses most of its energy at the end of its journey.

Quite recently, a proton beam has been used for identifying various elements in a biological specimen. This is done by analyzing proton-induced X-rays. This technique has great potential, e.g. it can determine the distribution of various minerals in some diseases.

Similarly in X-ray photography, Holography (which is also known as lens-less photography) has been applied to get very clear pictures of organs. In this

case, two X-ray photographs are taken, one with a proper opaque dye injected in an organ and the other without any dye. Using the technique of Holography, one then subtracts the two photographs and the final image gives a very clear-cut outline of the organ.

### *Ultrasonic technique*

Ultrasonic sound is of very high frequency (more than 20,000 cycles/sec). Its use in micro-surgery at low temperature is quite well known as its use for cleaning and sterilization in the clinic.

Recently, this technique has been used in detecting tumor in the brain, stone in the kidney and measuring the foetal heart rate, etc. The basic fact used is that the ultrasonic sound gets reflected attenuated at the boundaries, where there are discontinuities in the refractive index. The time lag between the incidental ultrasonic beam and reflected beam is displayed on the oscilloscope screen. This is called 'A' type scanning, when the information in the attenuation is also taken into account, the scanning is called 'B' type scanning. Both types are very useful in the clinic and many times have replaced the conventional X-ray as to avoid any damage. The third physical principle used in ultrasonic diagnosis is the Doppler Effect. Here the pitch or the frequency of the beam, reflected from any moving object, changes. This fact is used in studying moving objects, like pulsation in the artery, the valve motion in the heart and so on.

Recently, analysis of sound in the audible range (80-15000 cycle/sec) has also been used in the clinic. For instance, the cries of the newly born baby have

been subjected to investigation. The procedure is to record the sound on a good tape recorder, then have its acoustical characteristics recorded by an instrument called the 'sound spectrograph'. This instrument splits the sound into its component frequencies. The analysis of these spectrograms gave definite clues about the infant's early disorders in mental and motor development.

### *Isotope tracer technique*

This is a well known technique, where a particular radioactive isotope is administered in the body and its distribution is detected by the Geiger-Muller counter. Due to the specificity of the uptake of these isotopes by different organs, it is possible to see whether the uptake is normal or abnormal. The abnormalities in the uptake are then correlated with the dysfunction of the organ. The most commonly used isotopes are radioactive iodine,  $I^{131}$ , (gamma-ray emitter) and phosphorous  $P^{32}$  (Beta-ray emitter). The  $I^{131}$  is used for detecting thyroid function. Dye fluorescein labeled with  $I^{131}$  is used for locating brain tumors while  $P^{32}$  is used for locating breast tumors.

Recently, progress has been made in visualizing an organ, by measuring the radioactivity of the injected isotope, simultaneously at many places. This involves a determination of both the spatial and temporal pattern of isotope distribution in an organ.

Then, while using the computer for image processing, one gets a print out or a direct image on a T. V. tube. This technique has been used for liver and kidney scanning, in the detection of early bone

lesions and the pulmonary function in the cerebral blood flow and so on. Fig. 1 shows a typical example of a computer print out of an abnormal lung scan by a radio isotope. It appears that this new field, known as 'quantitative imaging technique' has tremendous potential and needs a greater interaction between the physician and the computer.

### *Current, voltages and impedance measurements*

These are the parameters which have been used in the clinic, almost since their discovery. We shall try to give some of the highlights of their recent clinical use.

The most well known use of the passage of high current in the body is in shock treatment (300—1200 mA), where 70—150 volts are applied to the electrode across the head for about 0.1 to 0.3 sec. These currents are presumed to bring about significant changes in the function of the central nervous system. Another case is that of defibrillation, in which different parts of the heart contract independently. Here also high current for small duration has to be passed through the heart in order to bring it out of the fibrillation condition. Similarly, current pulses are used in determining the excitability of muscles and nerves and in treating the denervated and atrophying muscles. Small pulsating current is found to be useful in removing a few types of pains.

Attention has recently been given to curing some diseases by passing current through the specific points on the body. This therapy, known as 'Ryodoraku therapy', has yet to be recognized by conventional medical clinics. This is so

because, till today, no definite correlation has been established between the biochemical and pathological changes and the passage of current through these low resistance points.

The measurement of voltage or potential in the clinic is so widely practised that it is difficult to list all the known applications. When one measures the pH of a solution, it is actually the measurement of potential. In electro-cardiogramme (E.C.G.) it is the measurement of potential difference on the surface of the body generated by the heart. Similarly, in the electroencephalogram (E.E.G.), the potential difference on the surface of the cranium, due to the action potential of neurons in the cerebral cortex, is measured. For measuring temperature with a thermocouple, one has to measure small potential differences. In general, these potential difference range from milli to micro volts and require amplifiers of high input impedance, high gain, low noise and good frequency response. With the availability of transistors and integrated circuits, now it is possible to have such reliable equipment very handy.

Currently, the chemical electrodes using semipermeable membrane are used for measuring partial pressures of oxygen and carbon dioxide, pH, sodium and potassium ion's concentration in the blood plasma. It has also been suggested that these methods could be used for continuously monitoring blood chemistry for the whole body or specific organs. The main technical limitation is the relatively long response time of these probes.

The measurement of impedance of the body or the resistance of the body to a passage of alternating current at various frequencies has been used for measuring the blood flow and blood pressure. This

is known as impedance plethysmography. Here the variation on the resistance intermediate and high frequencies is recorded, where the changes are due to mechanical volume pulse of the blood and other intra and extra vascular volume shifts of the fluid. When electrodes are placed on the scalp and the changes of impedance are measured it is called rheoencephalograph (R.E.G.), and this shows a relationship with cerebral blood flow. Similarly, when impedance changes are measured with electrodes used for electrocardiograms (E.C.G.) one gets impedance cardiography. Figs. 2 and 3 show the R.E.G., E.E.G., E.C.G. and impedance cardiogram. Different types of information could be obtained from these records, depending upon their origin. The impedance measurement could also be used for detecting eye movement (impedance oculogram), salivation and blood clotting.

It has been known that the resistance of the whole body depends on the number of active sweat glands under the measuring electrode. The conductance, which is the inverse of the resistance, is found to depend linearly on the number of sweat glands. Thus a large decrease in the conductance on some patch on the skin of the body with respect to its surrounding skin clearly indicates the degeneration of sweat glands. This fact could be used in detecting leprosy in an early stage.

I have not covered all the physical branches used in the clinic. Spectroscopic methods, electron spin resonance, nuclear magnetic resonance, laser technique and many other physical methods have special roles in the clinic.

Considering these clinical methods, which require quite sophisticated





FIG. 1 A lineprinter display of an abnormal lung scan (not to scale)

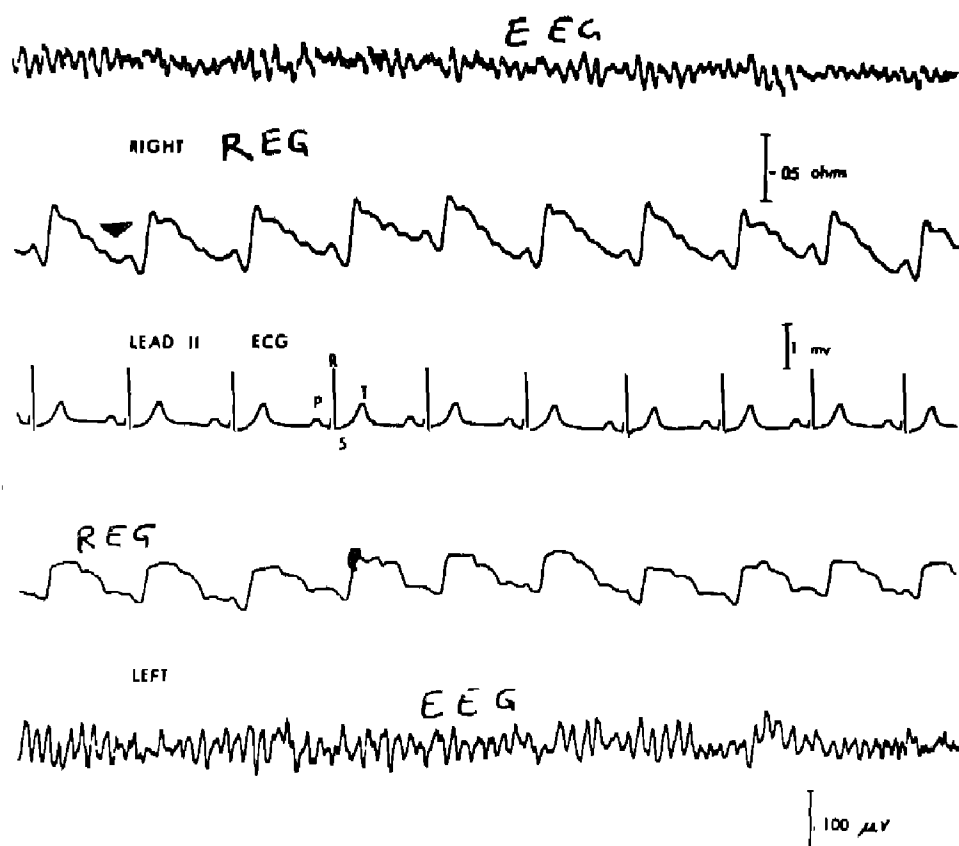
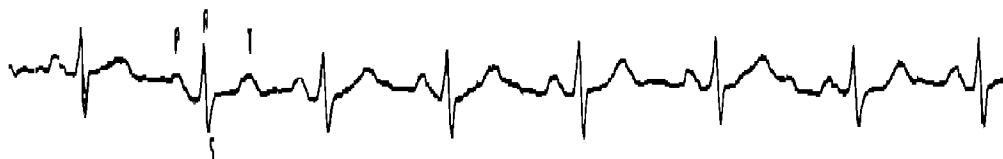
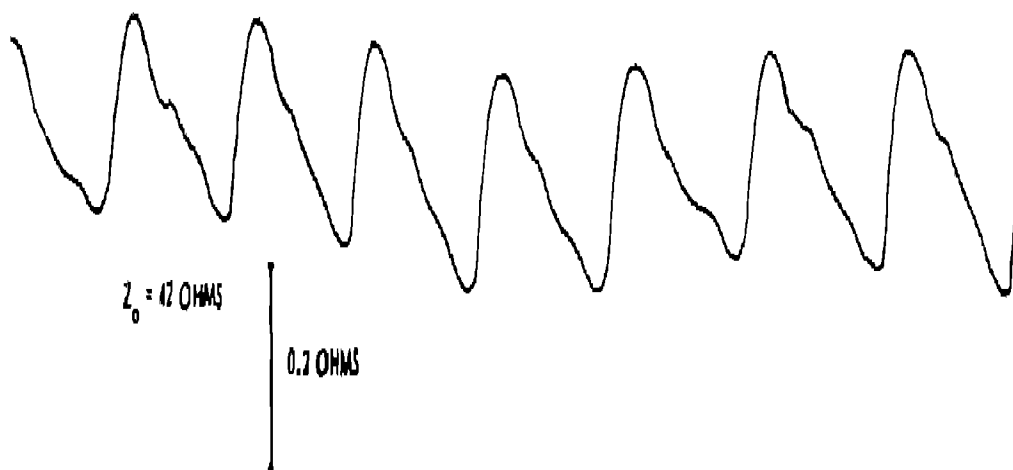


FIG. 2

ECG



$\Delta Z (-\frac{1}{2})$



TIME MARKS = 5 SECONDS



FIG. 3

instruments as well as fairly good medical knowledge, it is high time that a medical-technician course was started. Such courses are existing abroad, training medical as well as non-medical people for such types of jobs. These trained people could be of great help to the regular medical profession. □

# Educational News

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## Education for a new society

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*Excerpts from the speech of the Prime Minister, Smt Indira Gandhi, delivered on 24 April 1976 at the first convocation of the North-Eastern Hill University, Shielong*

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EDUCATION is a process of training the various faculties of a person, enabling him to achieve harmony between them and to become more keenly conscious of his responsibility to his country and to humanity as a whole. It is not merely what you learn but how you use your knowledge and what sort of person you become.

"The modern educational system in India has drawn inspiration mainly from the Western model, stressing individual advancement. It has become a means to a degree or other external criteria for employment. The emphasis has been on getting and not on giving. Concern for and cooperation with others and feeling responsible for corporate welfare has been comparatively neglected. The truth is that the more you offer to life in thought and in action, the broader will be your horizon, the greater your opportunities. The more you serve, not yourself, but your country and your

people, the greater will be your contentment and sense of fulfilment.

"But with all its limitations, our educational system has produced an impressive number of public spirited and talented men and women. Since independence, expenditure on education has increased phenomenally and even though the system has not been overhauled, it has been imbued with a deeper social purpose. It has opened its doors to backward regions and to strata of society which had earlier been deprived : the people of the hill and forest areas, the scheduled castes and tribes, and women in general. It has brought social mobility in a static, hierarchical society. That is why although prudence demands limiting the number of admissions to colleges, so far we have not followed a restrictive policy. It is essential for national well-being to break the old walls of privilege and ensure that new hurdles do not obstruct anyone's progress.

"Education and employment have led to a new consciousness of national unity. A young person born in any part of the country, however remote from metropolitan cities and centres of industry and commerce, should consider the entire country as his,"

"To my mind, education is the spirit of enquiry, the ability to keep one's mind and heart open to beauty and goodness, indeed all that surrounds us, to be able to think and judge for oneself. Education should inculcate a life-long habit of learning. And today this is all the more necessary because the corpus of knowledge is increasing at a tremendous pace, often making what one has learnt obsolete."

## Lunacharsky—Founder of Soviet Pedagogy

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*One of the most gifted and prolific figures that shaped the new Soviet state in the years immediately after the October Revolution was Anatoly Vasilyevich Lunacharsky.*

*In the following article, Nikolai Gontcharov of the USSR Academy of Pedagogical Science, describes Lunacharsky's most important accomplishment, as People's Commissar for Education, from 1917 to 1929.*

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WHEN LENIN formed the first Soviet government in 1917, he chose Anatoly Vasilyevich Lunacharsky as Commissar (minister) for Education. The task facing Lunacharsky and his colleagues amounted to effecting a cultural revolution. It was to find the appropriate means of bringing knowledge to the masses—in a country where 70 per cent of the population was illiterate—and to accomplish this without neglecting cultural and scientific development.

### *From kindergartens to antiquities*

The education commissariat was responsible for the creation of a nation-

wide educational system, from kindergartens to the Academy of Science, and taking in such out-of-school activities as political education for adults, as well as literary and theatrical undertakings and the protection of monuments.

The key element in this huge cultural effort was the state school system and in particular, schools providing a general education. Lunacharsky stressed the need to arrive "as quickly as possible at universal literacy by setting up a school network that meets the requirements of modern pedagogy, and establishing a free and compulsory education system, as well as creating sufficient training establishments to produce the army of teachers needed to instruct the population of immense Russia."

A government commission on educational reform headed by Lunacharsky himself was the scene of intense discussions often marked by violent differences of opinion about the form and content of the new system. Similar debates took place in the press and in teachers' meetings.

In the autumn of 1918, Lunacharsky told the first Pan-Russian Congress on education that only when the people had fully mastered both the means of production and knowledge could they consider themselves as a victorious and sovereign power.

The economy, he said, must be managed on a scientific basis and "this requires a very high level of education... We are fully aware that the people cannot set up a system of government and organize public life, just as they cannot manage the economy, unless they are educated and have acquired the necessary level of knowledge."

### *The Ideal Teacher*

Speaking of the teacher's creative role, Lunacharsky said "he must be the most universal and perfect man possible in our society...No other profession makes so many demands on a man."

The congress approved changes designed to do away with class distinctions in education by replacing the existing system of grammar, trade, business and other schools with a single system from nursery school onwards. Instruction was to be secular, free and in the student's native language.

The school was to be managed by a council including not only the staff but representatives of the local community and some of the older students. Self-management by the students was also to be provided for.

"Life in an educational establishment must be built on the basis of complete freedom, with all members of the collective meeting in groups and circles—such as teachers' and students' councils—to pursue teaching and educational objectives."

Lunacharsky favoured a system providing a general and poly-technical education. This met with resistance from some educationists who would have preferred to see schools providing specialized education directed towards a particular career. But Lunacharsky was adamant that a balanced general and polytechnical education better prepared the way to professional training.

Manual work as part of schooling could become a valuable educational tool, he thought, but only when it was organized as a social and creative force that did not constrain the pupil's personality.

For Lunacharsky, the development of the individual and of a new form of

society implied a continuous acquisition of knowledge—today we would say "life-long education"—supported by a broad network of educational and cultural institutions both "in" and "out-of-school".

"Out-of-school education should be based on museums, libraries, theatres, people's universities, adult education courses, sports clubs, etc., so organized that the people are drawn to these centres where they can learn and learn how to learn, thereby adding to the wealth of the community."

Going far beyond the struggle against illiteracy, Lunacharsky's ministry set up facilities to educate specialist cadres and a new intelligentsia, including specialized schools for adults and workers' institutes, offering those of proletarian and peasant descent a preparation for higher education.

The 12 Years Lunacharsky spent as People's Commissar for Education were a difficult but all-important period for the new Soviet state; they brought out the best of his talent.

UNESCO FEATURES

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## FROM THE FIELD UNITS

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AHMEDABAD

*Towards + 2*

Gujarat had introduced the new pattern of education in 1973 and after the first S.S.C. Examination according to their new syllabus, the first year of the higher secondary stage opens in 450 schools of Gujarat from June 1976.

The details of the new scheme as in operation in Gujarat are as follows

There are 25 secondary schools in the state. Out of these 450 schools teach the first year of the higher secondary stage i.e., Class XI. They may be known as "A stream schools". The following subjects are offered.

#### STREAM 'A'

##### Core Subjects

1 & 2 Any two of the following languages :

- (i) Gujarati
- (ii) Hindi
- (iii) Marathi            One to be taken at the
- (iv) Sindhi            higher level and the
- (v) Urdu            other at the lower level.
- (vi) English.

3 Problems of modern life in reference to Indian culture.

4. One craft

5. Physical education

*Optional streams* 1. Arts, 2. Commerce,  
3 Science

One of the following crafts :

- 1 Electronics
- 2 Maintenance and repairs of electrical gadgets
3. Wood-work
- 4 Short-hand
- 5 Chemical Technology
- 6 Tailoring and dress-making
- 7 Embroidery and fancy work
- 8 Metal-work
9. Cookery and nutrition
10. Toys and puppetry
11. Card-board modelling and book-binding
- 12 Book-keeping

*Optionals* . Arts Group

One of the under-mentioned special languages or German Language both in Classes XI and XII

- 1 Sanskrit
2. Persian
- 3 Arabic
4. Pali
5. Prakrit

#### Class XI

Any two of the given subjects :

1. Any one language at the lower level, if it has not been offered as a core subject.

2. Elements of Economics

3 Introduction to Indian Politics

4 Elements of Statistics

5 Mathematics

#### Class XII

1 Same as in Class XI

2 Economics  
3 Introduction to Internal politics

4 Elements of Psychology

5 Elements of sociology

Any two of the following subjects :

1. World Geography

2. World History

3. Religions of the world

1. Logic

2 Mathe-  
matics

3. Two ques-  
tion Papers  
of 100 marks  
each will be  
set in each  
of them.

*Note* : Total number of subjects in Classes XI and XII 9.

#### Commerce Group.

##### Class XI

1. Elements of Commerce

2. Elements of Economics

3. Elements of Commercial Geography

4. Commercial Mathematics

##### Class XII

1. Elements  
of Com-  
mercial  
correspond-  
ence

2. Elements of  
Book-Keep-  
ing

3. Elements of  
Banking of  
Business  
Admini-  
stration

4 Commercial  
Mathema-  
tics

5. Secretarial  
practice  
and (i)  
Office  
Corres-  
pondence,

	or (ii) Shorthand and typing	II. Minimum <i>two</i> and maximum <i>three</i> subjects out of the following :
Science Group		1 Prachin Bhasha (Classical language)
<i>Class XI</i>	<i>Class XII</i>	2 Elements of Economics
1. Mathematics	1. Mathematics-I	3 Introduction to Indian Politics
2. Physics	2 Mathematics-II	4. World History
3. Chemistry	3. Physics	5. World Religions
4. Biology	4 Chemistry	6. Indian Constitution
	5. Biology	7. Physics
		8. Chemistry
		9. Biology
		10. Commercial Geography
		11. Elements of Commerce

In general, a student will select his group or stream keeping in view the stream which he want to join later on. From the list of crafts a school will select one industrial craft. There will be a public examination at the end of Class XII and the successful candidates will be eligible for admission to institutions of higher education or for vocations in their later life.

#### STREAM 'B'

Besides such schools which have been selected for Stream 'A', other schools may take up the higher secondary curriculum in a modified form as follows :

#### Core Subjects

1 & 2 Any *two* languages of the following, one at the higher level and the other at the lower level :

- |            |            |
|------------|------------|
| 1 Gujarati | 4. Sindhi  |
| 2. Hindi   | 5. Urdu    |
| 3. Marathi | 6. English |

3. Problem of modern life in reference to Indian culture

#### Optional Subjects

Any *two* of the following :

1. Mathematics or Commercial Arithmetic.
2. Science
3. Smaj Nav-Nirman (Social Reconstruction)

On comparing Stream A and B, it can be seen that in Stream 'A' students have to decide right in the beginning of Class XI, which particular group they want to join, i.e. Arts/Science/Commerce, whereas in Stream 'B' students have to make this choice at the end of Class XI, when they have passed the public examination and want to take admission in the pre-university course.

The syllabi will be so adjusted that the pupils studying in both the streams will be at par in the first-year degree course.

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#### ALLAHABAD

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#### New Evaluation Scheme in Schools

The State Education Department has decided to hold home examinations uniformly in all the 4,500 high schools and intermediate colleges of the state. Under this scheme a weightage of 40, 20 and 40 per cent would be given to monthly tests, half yearly examination and annual examination respectively. The students will be promoted on the basis of any two of the three types of tests stated above so that one may not be handi-



capped on account of not being able to appear at any of the examinations. There would be five monthly tests and the names of the months have also been laid down for the purpose but the best four scores of the five tests would be considered when arriving at the score on the basis of the monthly tests. One of the features of this programme is that there would be a supplementary test of the unsuccessful candidates in the last week of June and prior to that, where failure is large, some remedial teaching may have to be given.

#### *Book banks in schools*

The Director of Education has announced that a sum of Rupees one crore had been set apart for setting up of book banks, especially for the use of children of the weaker section of the society.

#### *Reorganizing teacher education*

The period of Basic Teachers Certificate course would be extended from one year to two years and there would be only two teacher education programmes, one for the elementary stage, i.e. B. T. C and the other for the secondary stage, i.e. B. Ed./B. T./L. T. The intermediary teacher education course, viz., Certificate of Teaching (C. T.) has been abolished.

#### *Secondary school Principals meet*

For the first time in Uttar Pradesh about 300 principals of the secondary schools from all over the state met in a convention on 21-22 February 1976 at Allahabad and decided to form a State

Association of secondary school Principals. About 300 delegates attended the Convention. A symposium on "The Role of Principals under the Changing Pattern of Education" was held.

#### *Regional centres of state Institute of education*

It is proposed to open five regional centres one each at Jhansi, Muzaffarnagar, Gorakhpur, Lucknow and Almora to take up inservice education programmes. A scheme to decentralize the work under the overall supervision of the Principal, State Institute of Education, is being worked out.

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POONA

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#### *Workshop in work experience*

At the request of the newly created State Institute of Education, Goa, NCERT's Work-Experience Unit organized a four day workshop in Work-Experience at the Junior College of Education, Porvorim, Goa. The workshop was attended by Principals/teachers from 31 schools in Goa, and its deliberations covered the following topics :

1. The Maharashtra Programme.
2. Agricultural Activities.
3. Commerce and Service Activities.
4. Industrial Activities.
5. Implementation of Work Education Programmes.
6. Classification of Occupation.
7. Synopses of Work-Experience held in various schools in Goa.

A blue-print for the curriculum for implementing Work-Experience Programmes was prepared at the Workshop.

### *Students and community development programmes*

Projects aimed at utilizing the services of students for community development are being planned by six Universities in Maharashtra. A few of the projects will be undertaken during the summer vacation while some other will be implemented in the next academic year. Each institution will select the project sites in consultation with the District Collectors and Zilla Parishad officials. The Department of Youth Services of the Maharashtra Government is preparing material for the orientation programme for volunteers. The main purpose of this scheme is to enable students to work together in community development.

### *Evaluation of teachers by students*

A new working pattern, which could have had a deep impact on the teaching fraternity and on the student-teacher relationship as a whole, is being evolved at Bombay University. For assessing the worth of a teacher, the students will now be asked to evaluate their teachers, not on the basis of their academic qualifications but on the basis of the quality and impact of their teaching. The scheme, which was mooted by the University Grants Commission, has already been implemented by two colleges. It will be extended to more colleges during the next academic session. The assessment is conducted in the form of a questionnaire drawn up by the college to

suit its requirements. Opinions collected in this way are passed on to the individual teacher concerned, to enable him to take stock of himself objectively. In the two colleges where the scheme has been tried out, the assessment is mainly confined to higher level students. It is, perhaps, too early to assess the scheme itself, but it would seem that, in effect, it helps both teachers and students and could ultimately bring about a qualitative improvement in class-room teaching.

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### FROM THE S. I. Es.

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The State Institute of Science Education, Jabalpur, has been trying the following innovations in science education.

#### *Internship programme*

In internship programme all the pre-service B Ed. students are attached to the school under the senior and talented science teachers for about a month. The trainee has to become the part and parcel of the school and he has to seek guidance from the senior science teacher to whom he is attached. The trainee learns about the planning of laboratory, classroom teaching, science club activity, etc. under limited conditions. This programme is found to be of much help to science teachers.

#### *Seminar reading programme*

In the seminar reading programme, the trainees select a topic of their own choice and trace it in their own group. The

latest content and technique of teaching is used for this purpose. Fruitful discussions do arise in this programme. Sometimes the same lesson is taught by several methods and the selection of the unit method for teaching the lesson is done. The supervisory staff guides the programme. Under this programme the group behaviour of the trainees and their reactions can be very well judged. In this programme the trainees get an opportunity to publicize and practise their own ideas.

### *Unit planning*

It is an academic discussion and an analysis of teaching practice of the pupil-teachers. The unit planning is done, keeping in mind the importance, continuity, correlation and use of various aids in teaching. The plans are discussed threadbare in groups.

### *Investigatory approach*

In the investigatory approach, the topics to be taught are oriented in such a way that the children may have to think and devise the means to learn the concept. The students have to actively use the three learning domains cognitive (mind or head) affective (heart) and psychomotor (hand) in this approach. The trainee-teacher acts as an instructor.

### *Individual teaching*

In the individual teaching every supervisor is allotted a group of three and four students. The supervisor will guide his students in selecting the school and the level of a student and the method of teaching. His work-load will be just sufficient. He will see the classroom interaction and will guide accordingly. He can also experiment with his own ideas. The individual teacher will be benefitted in getting a rigorous and continuous guidance from the same supervisor. All the supervisors and the trainees will assemble once a week in a tutorial class to discuss the utility of the experimented lessons.

### *Group teaching*

In the group teaching, the trainees working under a group of supervisors will prepare lessons up to Class VIII and will go to the nearby villages in a mobile van. Such trainees will teach the content of science, using modern techniques, in village schools. More stress will be given to use investigatory approach. It will be tried to link the concept to be taught with the environment around the village or to the day-to-day life. The trainee may be free to teach the same lesson in as many villages as he likes till he attains the perfection. □

# Book Reviews

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## Teacher Education : Some Thoughts

V S Mathur, Aggarwal Prakashan,  
Price Rs 25.00, 1975, pp. 134

TEACHER EDUCATION has attracted the attention of experts to improve the quality of teachers that society needs. In the past, little attention was paid towards the improvement of teacher education. This is no longer true. A good number of research papers and books are available on this subject. One such book is *Teacher Education : Some thoughts* by Prof. V. S. Mathur. It throws some new light on the field of teacher education. He has given some suggestion to improve the quality of teacher education through different ways, for example, increase in the duration of the course on the lines of medicine and engineering etc. He has proposed compulsory residential facilities for the in-service, ex-service and extension service programmes, etc

In the first chapter, "Teacher Education", Prof. Mathur says that every educational problem has two dimensions : the qualitative and quantitative. For a backward country (like India early this century) the quantity claims priority over quality. But today it is evident that in India (now a developing country) the quality is assuming importance. Therefore, the author pleads for simultaneous

attention to both quantity and quality, because if once the quality is lost it is seldom regained

In the second chapter "Strengthening Teacher Education", he wants to increase the duration of training course for both the elementary and higher secondary school teachers in order to get mature and self-confident teachers. This may be good enough for the elementary school teachers. But in the case of higher secondary school teachers, there is no distinction between the training course of TGT and PGT. In my opinion, the course for the graduate teachers may be increased from one to two years. But for the postgraduate teachers this would not be necessary.

In the same chapter, he suggests compulsory stay in hostels for the local candidates and the teachers to improve the quality of teacher education. But this seems to be an impractical suggestion as residential facilities are already scarce and fresh investment in building is inadvisable. In fact, in place of compulsory stay in hostels, we should try to have good libraries laboratories, teaching aids, etc. These facilities should be made available not only during the training period but also during the teaching period. Surely this is a more effective method of improving the quality of teachers than providing

and the hostel facilities which may not necessarily lead to good results.

In the fourth chapter "Are Our Training Colleges Effective?" he wants to make them effective through: (i) expansion of B. Ed. course to four years, (ii) and by requiring the teachers to be sent to school for some time.

On both these counts one suspects there can be little unanimity of opinion. Today, there is no place for untrained teachers, and the four-year course of training has not been very successful.

Prof. Mathur has a complaint against the trained women teachers who do not enter the profession or if they do, do not stay in the profession for long. They leave the institution for marriage and migration. Here one is reminded of the European practice where the middle aged women are encouraged to enter the employment market as they are free by that time from household work. Prof. Mathur would like to see the administration of the training programme to be taken over by a single directorate of education. But nowhere in the book he recommends a representation of intelligent and active teachers from different schools. There must be a place for the teachers as members or advisers in the Directorate of Education. This approach may be helpful in improving the quality of teachers education.

S. AISHA BEGUM

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✓ The disadvantaged preschoolers in greater Bombay

Mandakini Khandekar, Tata Institute of Social Science Series No 36, 1976, pp. xi+ 472, Price Rs 60.00

"The Disadvantaged Preschoolers of greater Bombay is a valuable contribution to

understanding the conditions in which many preschoolers live. The careful sampling design and organization of the main study and sub-studies provide a wealth of information which can meet the data needs of a wide variety of government and voluntary agencies and workers serving preschool children". The above comment by Dr. Sindhu Phadke in the forward to this excellent book sets the tone for the reader.

The report is a valuable resource to those seeking information on city-suburb differences in the awareness and utilization of welfare services. Besides providing a detailed discussion of the problems, that are likely to be faced in providing adequate services, the author suggests meaningful strategies for achieving the desired changes.

In Chapter 1 of Part I, the author prepares the reader with a general overview of the report. The research design and the major components of the study are outlined in the next chapter. Chapter 3 provides a description of the sample households, a background against which the findings of the main study are viewed. The next two chapters present information on some of the aspects of child health and nutrition. The nutritional assessment of preschool children by the Indian Academy of Paediatrics is also included. Chapter 6 deals with the data on preprimary education and welfare services. The summary and conclusions are presented in Chapter 7.

Part II presents the findings of the sub-studies on utilization of child welfare services; social dimensions of child nutrition, and views of community influentials on services of preschool children. The work and potentialities of the welfare agencies serving the preschoolers is discussed in the last chapter.

The focus of the report is on the main study, undertaken to provide relevant data for the experimental projects planned by the Government of India and the UNICEF, to provide integrated services to the children and youth in the disadvantaged sections of the society. The major objectives of the main study were: (1) to obtain data on selected demographic and socio-economic characteristics and physical environment of the selected areas and households; (2) to obtain information on conditions constituting health hazards to preschool children and on their nutritional level, (3) to obtain information on the incidence of morbidity among preschool children and the pattern of care and treatment in case of illness, (4) to obtain information on the community resources likely to be of use to preschool children and on the households' utilization of these resources; (5) to obtain information on the parent's understanding of the problems and needs of their preschool children and to determine their attitude to the existing programmes of welfare of preschool children, (6) to suggest guidelines for formulating a minimum programme of integrated services for preschool children in urban areas, and (7) to study the existing institutional framework for child welfare in the selected areas.

The findings of the study highlight the differences between the city ward and the suburban ward. The advantage of age, education, income, understanding, and attitudes are observed to lie with the suburban households but they are not well served by the programmes and services for mothers. The influence

of a number of social characteristics on the different aspects of the situation of the preschoolers are analysed and their implications for the different programmes spelt out.

One of the merits of this book is its synoptic and synthesizing stance. The chapter on summary and conclusions is particularly noteworthy for its brevity and clarity. The writer is at her best when analysing the conclusions of the research studies, bringing out their implications in terms of meaningful strategies for achieving desirable changes in child care practices. Where findings are contrary to expectations, the author is careful to point out the need for further investigation.

In her foreword Dr. Sindhu Phadke rightly points out report "...has set a model for organizing inter-disciplinary collaboration in research a trend which is bound to assume increasing relevance in view of the complexity of human needs and services to meet the same". This reviewer concurs and would like to add that this is a must-reading for anyone actively engaged in research in this area. The detailed appendices are a valuable addition to the book and will prove particularly helpful to research workers.

The author manages to sustain the interest of the reader by her lucid and refreshing style of writing. The readers will be rewarded for their time, whether their professional interests are education, research on welfare service oriented.

T.S. SARASWATHI  
Reader, Department of Child Development  
M.S. University of Baroda

# Annotated Bibliography on Physics Books

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1. WENHAM, E. J., DORLING, G.W. *et. al*  
*Physics: Concepts and Models*, Addison-Wesley  
Publishers Ltd (1972), London.

THE BOOK provides a coherent course of study in the fundamental science of physics to the pre-university students. It is assumed by the authors that the students to some extent, are familiar with courses like Nuffield o-level Physics and that elementary mathematics is studied concurrently. Nevertheless, all the important concepts have been developed from the first principles, Physics as a process and as a structure emerges in this book. While the concept development and model building illustrate the process aspect, the closely interconnected fabric of ideas has been presented to reveal the structure of physics.

Unit approach has been adopted in the book, the reliance being mainly placed on a sound appreciation of the method

and ideas with which physics is concerned. To help the students thoroughly understand the concepts and to enable them to apply the concepts effectively, some open-ended problems have been offered for solution at the end of each chapter. Mainly the S.I Units have been used throughout the book. There are altogether nine units in the book. Unit-1 sets the scene for other units and is to be studied first. Unit-2 treats dynamics from the 'momentum first' approach. Unit-3 is a relatively brief treatment of basic theoretical physics. Unit-4 is an introduction to a model for matter and to the science of material. Unit-5 is a generalized treatment of vibrations and waves. Unit-6 deals with electricity with special reference to various circuit element. In Unit-7, fields are treated together. While the Unit-8 establishes a relationship between matter and electri-

city. Unit-9 is a case-study of the development of the main ideas about the atom and its nucleus with a concern to mirror the process of physics.

2. GARTENIAUSS SOLOMAN *Physics : Basic Principles*, Holt, Rinehart & Winston, Inc (1975) New York.

THE BOOK is meant for those who is preparing for higher studies in physics. There are altogether 34 chapters distributed in two volumes. Volume I contains 18 chapters and Vol. II contains the last 16 chapters. Chapter 1 is introductory in nature. Chapters 2-12 deals with mechanics. Heat and thermodynamics have been covered in Chapters 13-17 and that of wave motion in Chapter 18. Electromagnetism and electromagnetic waves have been treated in Chapters 19-29 and geometrical and physical optics find place in the Chapters 30-33. The last chapter concludes with an introduction to quantum mechanics.

Although both the volumes deals with laws and physical phenomena of classical physics, a substantial number of references to the non-classical phenomena have been distributed throughout the text with an intention to familiarize the readers with the recent developments and also to make the reader aware of the limitations of some of the classical laws. In addition, a number of chapters contain optional sections which generalize or extend the text material to the recent discoveries.

A wide selection of questions and problems along with a sizable number of worked out examples have been included in each chapter. In addition, a broad spectrum of applications also finds place in the text, providing considerable latitude in adopting it to the courses of specialized needs. The S I. Units have been exclusively used in the book. To study

the book a course of calculus should be taken up concurrently.

3. FREDRICK J DUCHE *Introduction to Physics for Scientists and Engineers*, McGraw Hill Book Company (1975) New York

THE BOOK makes the general physics course a stimulating learning experience for the students of physics and engineering.

There are altogether 39 chapters. The contents are arranged in the following sequence: mechanics, heat and thermodynamics, electricity, waves and light, atomic and nuclear physics. Relativity is introduced early in the study of mechanics and is used throughout the rest of the book. The chapters on waves and light encompasses sound, mechanical and electromagnetic waves as a unified whole. Atomic and nuclear Physics are then discussed in details.

The book has its own special features. A technique, comprising three steps: (i) intuitive exposition, (ii) mathematical framework and (iii) practice has been adopted to make the book more useful and meaningful. The intuitive expositions helps the students to get a feel of the principle concerned. Mathematical framework treats the principle quantitatively and the practice offers the opportunity for the use of the principle. Another interesting feature of the book is that there are a number of short sections set off from the body of the text, providing interesting sidelights on the history of physics. In addition, there are discussions at the end of each chapter, which stimulate the readers' interest.

4. *A Textbook for Secondary Schools* (Classes IX and X) NCERT, 1975, New Delhi.

It is a textbook prescribed by the Central Board of Secondary Education, New Delhi to meet the requirements of the students



of Classes IX and X studying under the 10+2 pattern of schooling in which a general course (including science and maths) for all up to Class X has been envisaged

It contains 17 chapters 'Universe' and 'Physics in Daily Life' are its first and last chapters respectively. These two chapters present the historical perspective of the progress in physics along with its contribution to society at large. Various aspects of force and motion have been dealt with in Chapters 2-7, Chapter 8 deals with the kinetic theory of gases and Chapter 9 that of liquifaction and humidity. Chapter 10 concerned with sound. While optics has been dealt with in Chapters 11-13, electricity and magnetism find place in Chapters 14-16.

The most interesting feature of the book is that the main ideas dealt with in

different chapters have been posed in the form of questions to arouse the interest of the students and thus motivate them for learning. Another important feature of the book is that no separate chapter has been allotted for units and measurement. Instead, the relevant units have been used and explained in its natural setting at the appropriate places to make its study more meaningful. The use of S. I. Units throughout the book is another feature of this book. In addition, the use of mathematics has been kept to the minimum. The book is to be used in continuation of the books on Physics prepared by the NCERT immediate lower stage of schooling.

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# JOURNAL OF INDIAN EDUCATION

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## CONTENTS

### I EDITORIAL

- SHARADAMBA RAO 1 Adaptation of Culture-Free Intelligence  
Test-Scale 1
- RAJAPPAN NAIR 17 Impact of Sociological Factors on the  
Teaching Ability in the Classroom
- MANJIT SENGUPTA 26 Personality Characteristics of Creative  
Engineers . A Review of Researches
- G. M. MANDALIA 34 Elementary School Building for Efficiency  
and Economy  
NAJAMUDDIN
- R. C. SHARMA 45 Dropouts . An Exploratory Study

54 EDUCATIONAL NEWS

61 BOOK REVIEWS

65 SELECT BIBLIOGRAPHY



# Editorial

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THE PURPOSE of our choosing the present theme is to add to the countrywide debate on the current educational policy-making and the projected innovations. We hope to make our contribution fruitful by involving the community of teachers in India. Educational policy-making, or for that matter policy-making in any field, if not based on the concrete data supplied by the researchers in the field, will not bring about the innovations so much overdue in the context of the rapid social change we now experience.

Research activities in the field of education started around the early fifties when education was made a separate area of study with M. Ed., M. Phil. and Ph. D degrees in education. The spurt of research activities that followed was sudden. Not that all the research works undertaken and completed since then have been fruitful or meaningful in the context of the Indian situation, but in their totality these academic forays into the methodology, content and objective of education have been a great help in shaping our educational policies. In the beginning of this 'research era' perhaps we have not been discreet enough to weigh the priorities, and a good number of research works could not perhaps justify the scarce resources spent on them.

But now is the time for discreet selection of priorities because the latent potentialities with which we started way back in 1947 have been realized in many fields and have been changing our society since then. The set of immediate requirements and socio-economic objectives we had in the past have now changed beyond recognitions. And educational researches of necessity have to be tuned to the long-range socio-economic goals we have set for our-

selves. Any new research work undertaken and financed has to be judged in the context of these.

But all research activities, however intelligent and informed they may be, will fail to produce the desired results if they are not publicized and debated. A research work may illuminate a certain area of knowledge, but generally its findings may take a long time to percolate into the policy-making categories of the educational planners. It is at this point we have a positive role to play.

With a view to creating a milieu of fruitful controversy and debate, we have chosen the theme of 'Research in Education', and included some research papers and reviews. We have tried to present only a small section of the wide range of research works in education, inviting critical comments and appraisals from our readers, knowing that open, well-informed debates and controversy are the best test for the findings of any research worker worth his salt, and that only in this milieu of wide participation of the teachers, teacher-educators and educational administrators meaningful educational policies can be formed by the planners.

Writing in *Oxford Review of Education* (Vol. 1, No. 3, 1975), Jerome Bruner has regretted that educational research has failed to innovate "precisely by virtue of the absence of such public debate."

The present issue of *JIE* is a modest measure against such regrets in future. Indeed we could not agree more with Lionel Elvin when he says, "We clearly need more educational research, and of the strict kind, into matters on which for lack of information we are not yet competent to make sound policy decision." □

# Adaptation of Culture-Free Intelligence Test-Scale 1<sup>\*</sup>

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SHARADAMBA RAO

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## I

ONE important goal of Cattell's (1950) C. F. Intelligence Test has been to keep the continuity of the quality of intelligence measurement throughout the successive Scales 1, 2 and 3. Both for the sake of conceptual clarity in developmental investigations and consistency of prediction in routine school testing, it is important to maintain essentially the same factor composition from scale to scale. Scale 1 is designed for the age-group 4-8 years

and for fine discrimination among the mentally defectives and institutionalized adults; Scale 2 is designed for the age-group 8-14 years and for unselected adults. It extends from the elementary school through junior high school and is a good general purpose test for all but the college students (Cattell and Cattell, 1949). However, for routine and research testing, requiring fine discrimination between the brightest high school children and the higher performance range in most people aged 15-25 years, the psychologist should turn to Scale 3, which ranges from the upper high school population to candidates for higher executive and professional positions (Cattell and Cattell,

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\*The author thanks IPAT and Psycho-Centre for permitting him to adapt the C. F. Intelligence Scale in Hindi, and the NCERT for the grant towards this research.

1959). Again, for special purposes like scholarship, selection based on superior IQ, Cattell has been devised as "C" form of restricted Culture-Free Intelligence Test, which is not widely circulated, but could be obtained on special conditions from IPAT.

According to Cattell, if true mental capacity of children whose living conditions are different from the modern cultures, to which most of the intelligence tests and school achievement tests are presently used, to be tapped, the use of tests free from culturally contaminated items is called for. The sub-tests of Culture-Free Intelligence Tests use the perceptual medium and are factorially pure measures of "g". Scales 2 and 3 have four sub-tests : (i) Series, (ii) Classification, (iii) Matrices and (iv) Topology and are available in two forms rendering the retest of the same individual, using a different form, possible. The Scale 2 and 3 could be administered either individually or in group. The scoring is objective and the raw scores can be converted to IQ or percentile and the norms in Indian condition have been developed by the author (Rao, 1966). On the other hand, Scale 1 meant for children needs to be individually administered. The eight sub-tests are the outcome of factor-analysis of those Binet-type tests used in 1935, which were highly loaded with "g", along with an additional battery of half a dozen tests constructed according to the principles of testing innate intelligence without contamination from (1) learned skill and information, (2) temperament and character, (3) personal reactions of the examiner, which are the main objections against the Binet-type tests. Originally, there were only ten items in each of the eight sub-tests surviving out of a factor analysis of eighteen sub-tests. Later on each sub-test was in-

creased in length from 10 to 12 items to bring the total time to 40 minutes, thus attaining a happy compromise between length, reliability and the children's tendency to fatigue.

In devising tests of intelligence for the young children, it is necessary not only to discover tests which are a good measure of "g", but also tests which have immediate and intrinsic appeal to the child's mind, and so the test must resemble a game or borrow the glamour of games. That is what has been achieved in the eight sub-tests of CF Scale 1, selected on the basis of (1) saturation with "g", (2) freedom from group factors, (3) attractiveness to children and (4) length.

There is a gap between the concept of intelligence and the test result—IQ, as measured by a test, even in the region where the test is standardized. And again the gap exists when the test is standardized in one culture and is adapted to another culture. An investigation aimed at adapting a test has to answer many relevant questions. The present research is an attempt at it.

### *Objectives of the Present Study*

1. The main objective of the present research is to adapt Culture-Free Intelligence Test—Scale 1 in Hindi for Indian children.
2. The research is undertaken in Ranchi, a tribal area and thus provides a unique opportunity to compare the performance of tribal and other children on an intelligence test deemed to be fair to all cultures and to examine whether separate norms for tribal children are necessary.
3. Since the Indian norms for Scales



2 and 3 have already been developed by the author (Rao, 1966) the present work on Scale 1 completes a major step in providing the Indian psychologist with an instrument to measure innate intelligence at all age-groups and intellectual levels using the same test content, for use in educational institutions and clinical setting.

### METHODOLOGY

#### (a) Background of CF Intelligence Test-Scale 1

Unlike Scales 2 and 3, Scale 1 is not entirely culture-free due to the difficulty of obtaining a sufficiency of tests in the perceptual test medium that would sustain the interest of young children and meet other requirements special to this age range. However, Four of the subtests 1, 2, 3 and 8, according to Cattell (1950) are culture-free and can be used for cross-cultural comparisons. So separate Indian norms are developed for the subtests.

#### (b) Test Content of Scale 1

Subtest	No of items	Total time
1. Substitution	12	3
2. Classification	12	2
3. Mases	12	2½
4. Selecting names/objects	12	2½
5. Following direction	12	4
6. Wrong pictures	12	2½
7. Riddles	12	3½
8. Similarities	12	2
	96	22
	points	minutes

#### (c) Scoring is Objective

The items are arranged in the order of difficulty and each correct item is given one point. The possible score on each subtest is 12 and on the battery is 96.

(d) As per the manual, administration of the test proper requires 22 minutes; with preparation and instruction the testing period amounts to 40-60 minutes. Only Tests I and III are timed tests in which the children are asked to stop after 80 and 90 scores respectively. In other subtests, the child is only instructed to proceed with the test as quickly as possible, after explaining to him/her what to do, by means of examples or initial items.

#### Adaptation of CF Scale 1 in Hindi

The procedure consisted of.

- (i) Preparation of test booklet in Hindi,
- (ii) Preparation of instruction for each subtest in Hindi, provision was made to introduce new time limits in addition to the original time limit,
- (iii) Pilot studies based on 50 children — eight children from each age-group in the age range (4-9 years) were given Scale 1 to determine

- (a) Suitability of instruction in Hindi for various subtests,
- (b) Time limit,
- (c) Selection of age-group in the Indian context,
- (d) Extent to which culture-free tests are culture-bound in Indian context,
- (e) Extent to which the culture-bound tests are culture-free in the Indian context.

The results of pilot studies are not quantified, but the following observations are made.

- (i) Indian children are not generally exposed to testing situation so it is essential to establish rapport to get reliable result and so this results in nearly 40-70 minutes for administration of the entire battery, depending on the skill of the tester and the age of the child
- (ii) The test cannot be easily administered to the 4-year-old children; quite often they cannot even hold the pencil and do not understand the instruction. Again, even the 9-year-old children find the test interesting and so the age range in Indian conditions could be 5-9 years, instead of 4-8 years.
- (iii) Among the four culture-bound subtests, selecting named objects (IV), following directions (V), wrong pictures (VI), riddles (VII), it was observed that the original test items could be applicable to Indian situation without any modification only in the case of subtests, following directions (V) and riddles (VII). On the other hand, in the case of the subtests—selecting named objects (IV) and wrong pictures (VI)—some items from Indian situation need to be tried, since the items seem to be culture-bound and less appropriate to the Indian situation.
- (iv) In view of the lack of test-sophistication, i.e. working with a time limit, on the part of Indian children, particularly in Tests (I) and (III), higher time limits could be tried.

On the basis of qualitative-cum-quantitative analysis of the pilot studies the following changes were introduced in the original test: (1) some Indian items were introduced in subtest IV and VI for further investigation through item analysis about the feasibility, (2) time limits were increased by 10 seconds in Test I and Test III, (3) scoring key for the new items introduced in test VI in terms of acceptable and non-acceptable answers, on the guidelines given by Cattell, was developed according to the data collected from 125 children.

#### *Results from Item Analysis*

A restricted item analysis was done in the case of (a) Tests I and III, where new time limits were tried and (b) Tests IV and VI where new Indian items were introduced.

The main objective of item analysis was to check whether (i) increasing time limit by 10 seconds on Tests I and III is conducive for a better measurement of IQ; (ii) any new Indian items could replace some of the items in the original test with some advantage; (iii) the format of the original test be preserved so that each subtest consists of 12 items.

Table 1  
CORRELATION BETWEEN TOTAL SCORE  
AND SCORES BASED ON ORIGINAL  
AND NEW TIME LIMITS ON  
TESTS I AND III

		<i>Time limit</i>	<i>Test-battery correlation</i>
Test I	Original	80 secs	.59
	New	90 secs	.55
Test III	Original	90 secs	.60
	New	100 secs	.54

The results evidently show that the increase of time limit by 10 seconds does not give any advantage over the original time limit and hence the original time limits could be maintained.

Table 2

DIFFICULTY INDEX AND CORRELATION OF EACH ITEM WITH THE TOTAL SCORES DONE SEPARATELY FOR TEST IV AND TEST VI

<i>Item No. in original test</i>	<i>Difficulty index</i>	<i>Point biserial</i>	<i>New items</i>	<i>Difficulty index</i>	<i>Point biserial</i>
TEST IV					
1	100%	.00	1 (13)	87.5	49
2	100%	.00	*2 (14)	55.4	53
3	72.2%	.55	*3 (15)	44.5	53
4	75.9%	.57			
5	57.4%	.54			
6	59.2%	.66			
*7	29.6%	.36			
*8	22.2%	.38			
9	24.5%	.63			
10	16.7%	.54			
11	16.7%	.44			
12	14.8%	.40			
TEST VI					
1	100%	.00	1 (13)	92.5%	26
2	98.2%	.16	2 (14)	42.5%	.12
3	44.4%	.67	***3 (15)	35.1%	.59
4	66.6%	.49	*4 (16)	48.1%	.54
5	14.8%	.42	5 (17)	11.1%	.46
6	33.5%	.52	6 (18)	3.7%	.21
**7	5.5%	.24	7 (19)	9.2%	.34
8	12.9%	.40	*8 (20)	53.6%	.48
9	1.4%	.54	*9 (21)	44.4%	.62
10	14.8%	.48	10 (22)	3.7%	.25
11	5.5%	.36			
12	9.2%	.29			

In Test IV, taking both difficulty level and validity coefficient, items 7 and 8 could be replaced by items 2 and 3 of the newly introduced items.

Again in Test VI taking both difficulty level and validity coefficient, it appears that original test item 7 can be replaced by item 3 of the newly introduced items with some advantage.

## II

### COMPARISON OF GROUPS

The normative sample included boys and girls in the age range 5-9 years from the Hindu and tribal communities as per the following sample design.

SAMPLE DESIGN

Age	Hindu boys	Hindu girls	Tribal boys	Tribal girls
A1 5 yr	A1 (50)	B1 (50)	C1 (52)	D1 (50)
A2 6 yr	A2 (66)	B2 (65)	C2 (50)	D2 (50)
A3 7 yr	A3 (62)	B3 (61)	C3 (52)	D3 (51)
A4 8 yr	A4 (62)	B4 (65)	C4 (50)	D4 (52)
A5 9 yr	A5 (50)	B5 (51)	C5 (50)	D5 (50)

N=1089

The Numbers in parentheses indicate the number of children in each subgroup. Though the original plan was to include 50 children in the normative data, it was thought worthwhile to include the extra data collected in some subsamples.

**Objectives** Analysis of variance was done for the inter-group comparisons based on independent variables, age  $\times$  sex  $\times$  culture ( $5 \times 2 \times 2$ ) separately for (i) total score on the original eight subtests; (ii) total score on the adapted scale, in order to study: (a) whether there is a consistent rise in score from age to age, (b) the comparison of the scores of Hindu and tribal boys and girls; (c) the feasibility of computing separate norms for Hindu and tribal children.

Table 3  
RESULTS OF ANALYSIS OF VARIANCE

Score	F-Ratio
1. Total score on original test	29.4
2. Total score on adapted test	29.4 **
3. Subtest I	21.62 **
4. Subtest II	11.17 **
5. Subtest III	20.31 **
6.(a) Subtest IV	24.15 **
7. Subtest V	20.42 **
8. Subtest VI	111.2 **
9.(a) Adapted Subtest VI	17.93 **
10. Subtest VII	10.63 **
11. Subtest VIII	16.34 **

The results indicate that there are significant differences among the twenty groups in test scores on each of the subtests. Detailed study of mean differences was done in the case of each subtest and the entire scale.

Table 4 shows the significance of mean differences on the total score of CF scale.

Analysis of variance was done with respect to 20 groups on each of the subtests. Most of the significant mean differences are with respect to age. Only a few significant mean differences are with respect to variables sex and culture. Splitting the mean differences separately w.r.t. sex and culture, one finds—

The results reveal that out of 160 Mean Differences (8 subtests, 5 age-levels, 2 culture-groups and 2 sex-groups ( $8 \times 5 \times 2 \times 2$ ) only 33 mean differences are significant, indicating that sex differences (16) and culture differences (17) together are just about 20 per cent of the total possible mean differences.

These results point out to the fact that the test is essentially culture-free, and could be highly useful in a country like India with a number of regional languages and sub-cultural groups, where one can conveniently use a culture-free test for country-wide cross-cultural comparisons.

Again, this conclusion is feasible only with respect to school-going children in urban areas coming from the middle and low-income homes in view of the fact that the sample of the Hindu and tribal boys and girls in this study reflect the above characteristics. But if we want to test the intelligence of the tribal children from the interior villages—of such children who have had not the intellectual stimulation of the urban culture—one may find in all probability the significant mean differences on all the subtests of the CF

Table 4  
SIGNIFICANCE OF MEAN DIFFERENCES ON TOTAL SCORE OF C.F. SCALE

H-B										H-G					T-B					T-G				
A <sup>1</sup>	A <sup>2</sup>	A <sup>3</sup>	A <sup>4</sup>	A <sup>5</sup>	B <sup>1</sup>	B <sup>2</sup>	B <sup>3</sup>	B <sup>4</sup>	B <sup>5</sup>	C <sup>1</sup>	C <sup>2</sup>	C <sup>3</sup>	C <sup>4</sup>	C <sup>5</sup>	D <sup>1</sup>	D <sup>2</sup>	D <sup>3</sup>	D <sup>4</sup>	D <sup>5</sup>					
A1	—	1.48	5.95	10.20	15.56	5.02				3.67														
A2	—	4.47	8.72	14.08	1.51					0.28														
A3		—	4.25	9.61		—0.29					1.66													
A4			—	5.36			—3.61					0.92												
A5				—				—1.74					—0.14											
B1				—	4.99	11.26	18.83	22.32							—1.38									
B2					—	6.27	13.84	17.33							—0.41									
B3						—	7.57	11.06								0.43								
B4							—	3.49									1.04							
B5								—											1.08					
C1									—	74.87	7.69	12.95	19.37	—0.03										
C2										—	8.09	8.08	14.50		0.82									
C3											—	4.99	11.41			—1.52								
C4												—	6.42				—3.49							
C5													—						—0.52					
D1															—	4.02	9.45	16.41	19.86					
D2																—	5.43	12.39	15.84					
D3																	—	16.96	10.41					
D4																		—	3.45					
D5																			—					

.. M $\alpha$  significant at .01 level,  
 . M $\alpha$  significant at .05 level.

Table 5  
NUMBER OF MEAN DIFFERENCES SIGNIFICANT AT EACH AGE LEVEL

*Sex Differences*

Possibilities	Age					Total
	5	6	7	8	9	
1. Hindu boys get a higher score than Hindu girls	3	2	0	0	0	5*
2. Hindu girls get a higher score than Hindu boys	0	0	0	1	1	2
3. Tribal boys get a higher score than Tribal girls	1	0	0	1	0	2
4. Tribal girls get a higher score than Tribal boys.	0	1	2	4	0	7*
	4	3	2	6	1	16

*Culture Differences*

Possibilities	Age					Total
	5	6	7	8	9	
1. Hindu boys get a higher score than Tribal boys,	3	0	2	1	1	7*
2. Tribal boys get a higher score than Hindu boys.	0	0	0	0	1	1
3. Hindu girls get a higher score than Tribal girls	1	1	1	1	2	6*
4. Tribal girls get a higher score than Hindu girls.	2	1	0	0	0	3
	6	2	3	2	4	17

scale, because the testing situation and test content may be very unfamiliar to the children and hence the test results may not compare favourably with the urbanized children.

But one can conclude on the basis of the present normative sample, taken from the urban lower-middle class homes, that it is not necessary to have separate norms for boys and girls and also for Hindu and tribal children. Rodd (1958) found almost no difference between the mean of

Chinese students and a control group of comparably aged American students; and Fowler (1955) found like or no difference in score level between males and females. With the increasing urbanization and with better intellectually stimulating environment, it is likely that sex differences and social differences in the measured intelligence of children subjected to culture-free tests could be minimum. Such trends are reported in the researches on intelligence testing by MacArthan, *et al.* (1963).

Table 6

Age	G <sup>1</sup>	G <sup>2</sup>	Sq <sup>1</sup>	Sq <sup>2</sup>	Z <sup>1</sup> *	Z <sup>2</sup> *
5 years	0.84	0.28	0.1712	3406	4.90	.91
6 years	0.23	0.03	0.1604	0.3194	1.43	0.09
7 years	0.09	0.61	0.1618	0.3223	0.59	1.89
8 years	0.17	6.15	0.1609	0.1013	1.07	0.15
9 years	0.07	— 0.63	0.1716	0.3414	0.42	1.85

\* Values less than 1.96 indicate that the distribution is normal.

### III

#### NORMATIVE STUDIES

Test of normality for total score on CF Scale 1 done separately for each of the five age-groups 5, 6, 7, 8, and 9 years revealed that the distribution of scores is normal and the sampling errors are within statistical limits as revealed from the table above.

It is revealed that only in the case of the 5-year-old children the distribution is not symmetrical and may not warrant generalization from sample to the population, whereas in other age-groups one

can predict about the population.

Again, the literature on the intelligence testing of small children makes it clear that prediction of intelligence on the basis of measured intelligence is rather difficult.

However, the studies of the normality test in general, permits further normative studies to convert raw scores into deviation IQ for different age-groups. Normative tables to convert raw scores on each subtest to IQ are so prepared as to make it possible to use any combination of tests in the battery and use the original scale as well as the adapted test for measuring the IQ of the Indian children using Cattell's CF Intelligence Test Scale 1.

Norm Table 7 (a) . Original Test

#### CONVERSION TABLES FROM RAW SCORES TO IQ AGE-WISE ON SUB-TESTS

Age	Raw score	1	2	3	4	5	6	7	8	9	10	11	12
TEST-I													
5 years		78	88	95	100	105	111	115	120	123	128	140	—
6 years		71	83	90	97	104	110	115	121	125	129	140	—
7 years		71	79	86	93	99	105	112	116	121	125	128	140
8 years		—	78	84	89	93	98	105	111	117	122	126	128
9 years		—	71	79	84	90	96	101	105	111	115	121	124

Table 7(a) *contd.*

Age	Raw Score	1	2	3	4	5	6	7	8	9	10	11	12
TEST-II													
5 years	—	81	88	95	101	106	111	114	117	121	126	140	
6 years	—	77	84	90	98	107	110	115	120	124	127	140	
7 years	—	74	81	87	93	100	106	112	118	122	125	129	
8 years	—	71	78	84	91	98	104	110	115	121	126	129	
9 years	—	71	77	82	88	95	100	105	112	118	128	140	
TEST-III													
5 years	74	86	94	99	104	108	112	117	122	128	140	—	
6 years	72	82	88	94	98	104	111	118	123	126	129	140	
7 years	71	79	84	90	93	101	108	114	118	123	140	—	
8 years	71	77	80	85	91	97	104	109	119	120	125	129	
9 years	71	74	76	80	88	94	99	103	113	117	124	128	
TEST-IV													
5 years	—	83	91	97	102	106	110	116	124	126	128	140	
6 years	—	81	88	92	96	103	109	114	119	127	140	—	
7 years	71	83	84	88	93	98	106	111	117	122	140	—	
8 years	—	77	82	88	91	95	101	106	112	120	140	—	
9 years	—	79	84	87	89	94	99	104	110	117	124	140	
TEST-V													
5 years	—	77	84	92	99	104	109	113	117	121	122	126	
6 years	—	76	82	88	92	101	106	121	127	128	140	—	
7 years	—	73	77	83	89	96	102	109	115	120	124	129	
8 years	—	71	77	80	85	91	98	104	110	115	118	123	
9 years	—	—	—	76	81	88	95	99	105	109	112	116	
TEST-VI													
5 years	73	89	98	105	110	115	121	123	125	128	140	—	
6 years	73	85	94	102	107	111	117	121	127	140	—	140	
7 years	71	83	91	99	105	111	117	125	140	—	—	—	
8 years	—	82	89	93	100	105	111	117	123	126	140	—	
9 years	71	80	85	91	97	102	109	115	120	121	140	—	



Table 7(a) contd

TEST-VII												
5 years	—	78	86	93	98	103	108	111	116	122	140	140
6 years	—	78	83	89	96	101	106	112	118	127	140	140
7 years	—	—	79	86	92	98	101	109	115	121	127	140
8 years	—	—	76	82	87	92	99	104	111	115	126	140
9 years	—	—	76	81	86	91	96	102	109	116	126	140

TEST-VIII												
5 years	—	74	83	89	94	99	104	108	112	116	118	140
6 years	—	71	81	87	91	95	99	105	110	115	121	140
7 years	—	71	76	81	86	91	97	102	106	111	116	122
8 years	—	—	—	78	83	88	92	97	101	106	112	119
9 years	—	—	72	78	82	86	91	95	100	105	110	116

Norm Table 7 (b)

ADAPTED SUBTESTS IV AND VI: CONVERSION TABLES FROM RAW SCORES TO IQ  
AGE-WISE

## TEST-IV

Age	Raw Score	1	2	3	4	5	6	7	8	9	10	11	12
5 years	—	82	89	95	99	104	108	113	119	124	126	128	
6 years	—	79	87	91	96	100	105	110	115	119	126	140	
7 years	71	78	82	87	90	94	100	103	112	118	126	140	
8 years	—	75	80	85	89	93	97	102	109	118	121	128	
9 years	—	78	82	85	88	91	96	101	106	112	119	121	

## TEST-VI

5 years	74	88	97	105	110	114	118	122	124	128	140	—
6 years	74	85	94	101	106	110	114	120	126	140	—	—
7 years	71	83	91	98	104	109	114	120	128	140	—	—
8 years	—	82	89	94	99	104	109	114	120	124	126	140
9 years	72	79	85	90	95	101	106	111	117	121	126	140

Conversion Table 7 (c) from Raw Score to IQ Age-wise on the Whole Battery (Original Test)

<i>Age Raw Score-IQ Range</i>	<i>5 years</i>	<i>6 years</i>	<i>7 years</i>	<i>8 years</i>	<i>9 years</i>
15-19	75	71	71	—	—
20-24	83	76	75	71	—
25-29	88	81	79	73	—
30-34	94	87	83	78	—
35-39	100	93	87	82	71
40-44	104	99	93	88	84
45-49	108	104	99	93	89
50-54	110	110	105	98	94
55-59	113	113	110	103	99
60-64	116	118	114	109	103
65-69	119	126	120	113	108
70-74	124	140	125	119	113
75-79	140	—	140	128	121
80-84	—	—	—	140	140

Conversion Table 7 (d) from Raw Score to IQ Age-wise on the Whole Battery (Adapted Test)

<i>Age Raw Score-IQ Range</i>	<i>5 years</i>	<i>6 years</i>	<i>7 years</i>	<i>8 years</i>	<i>9 years</i>
15-19	76	71	71	—	—
20-24	83	76	75	71	—
25-29	88	81	78	74	—
30-34	94	86	82	76	—
35-39	99	93	87	82	78
40-44	104	98	92	87	83
45-49	107	98	98	92	88
50-54	109	104	106	97	93
55-59	113	109	109	102	96
60-64	115	113	114	107	102
65-69	119	117	118	112	107
70-74	124	123	123	126	113
75-79	—	—	—	140	119
80-84	—	—	—	—	140

Table 7 (e)

## TABLE IQ VALUES

Corresponding to raw scores in the age range 5-9 years (based on *S.D.* of 20 points for cross-culture comparison)  
on the Original C.F. Intelligence Test-Scale I (Sample 1089 children)

Age	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
	Raw Scores																					
5 years	57	59	61	63	64	66	68	70	71	73	75	77	78	80	82	84	85	87	89	91	92	94
6 years	39	41	43	45	47	50	52	54	56	58	60	63	65	67	69	71	73	76	78	80	82	84
7 years	27	29	31	33	36	38	40	42	44	47	49	51	53	56	58	60	62	64	67	69	71	73
8 years	—	—	—	—	—	25	27	29	32	34	36	38	40	43	45	47	49	51	54	56	58	60
9 years	—	—	—	—	—	—	—	—	—	—	30	32	34	36	38	40	43	45	47	49	51	53

Age	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
	Raw Scores																					
5 years	96	98	99	101	103	105	106	108	110	112	113	115	117	119	120	122	124	126	127	129	131	133
6 years	86	89	91	93	95	97	100	102	104	106	108	110	113	115	117	119	121	123	126	128	130	132
7 years	75	78	80	82	84	87	89	91	93	95	98	100	102	104	106	109	111	113	115	117	120	122
8 years	62	65	67	69	71	73	76	78	80	82	84	87	89	91	93	95	98	100	102	104	106	109
9 years	55	57	59	61	64	66	68	70	72	74	76	78	80	82	85	87	89	91	93	95	97	99

Age	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
	Raw Scores																					
5 years	134	136	138	140	141	143	145	147	148	150	152	154	155	157	159	161	162	—	—	—	—	—
6 years	134	136	139	141	143	145	147	149	152	154	156	158	160	162	165	167	169	—	—	—	—	—
7 years	124	126	129	131	133	135	137	140	142	144	146	148	151	153	155	157	159	162	164	—	—	—
8 years	111	113	115	117	120	122	124	126	128	131	133	135	137	139	142	144	146	148	150	153	—	—
9 years	101	103	106	108	110	112	114	116	118	120	122	124	127	129	131	133	135	137	139	141	143	145

## IV

## STUDIES ON RELIABILITY AND VALIDITY

Determining the reliability and validity of a test is an essential aspect of adaptation. Though Cattell has quoted high reliability of the different subtests, it was deemed essential to find the reliability of the same in the Indian context. Fresh data on 30 children were collected to find the split-half reliability and also 30 children from a homogenous group in the same school were retested after an interval of six months.

Table 7  
SPLIT-HALF RELIABILITY AND  
RETEST RELIABILITY OF THE SUBTEST

Subtest	Retest Reliability		
	Split-half	Original scale	Adapted scale
I*	X	.96	.96
II	.40	.81	.81
III*	X	.90	.90
IV	.55	.83	.93
V	.43	.81	.81
VI	.48	.84	.75
VII	.43	.74	.74
VIII	.45	.79	.79
Total	X	.94	.90

NOTE : Since the number of items in each test is only 12 and split-half reliability depends on the length of the test, the low correlations are technically meaningful. On the other hand the retest reliability is quite high and is in the range—.74-96—indicating that this scale can be used for individual testing

About validity, Cattell (1949) argues that in the case of a factorially valid test

like CF test, which includes only the subtests loaded with 'g', there is no need to ascertain whether the test is a measure of g. However, it is essential that since the very objective of testing is to be able to predict performance and to differentiate between criterion groups, it is essential to understand how CF Scale 1 fares in this respect in Indian situation. Only on a small sample of 15 tribal children where ratings by the teacher were available, correlations were computed between CF scale total score and (i) teachers' rating, (ii) school performance in annual examination, (iii) marks in mathematics

Correlations are high and in the range .64-.85. But this may be purely due to the homogenous nature of the sample and in the opinion of the researcher, further probing is essential in this regard, taking a larger sample and replicating the studies. An attempt was also made to follow up a few cases. However, many students as per the remarks of a teacher, give up their studies and the school achievement in high school is very low. Academic achievement is a complex measure dependent on many factors apart from basic intelligence, like individual study habits, home environment, socio-economic status among many other things

Again, since according to test constructors, CF Scale 1 is useful to find out the subtle intellectual deterioration in institutionalized patients and also the intellectual level of mental defects, an attempt was made to test the same by administering the test to 30 cooperative hospitalized schizophrenics (mental defective sample could not be available). One may find high grade morons or imbeciles even among general population, but the problem is to identify them by means of a reliable instrument other than CF scale,

Table 8

MEAN DIFFERENCE MATCHED GROUP BETWEEN SCHIZOPHRENIC  
SAMPLES AND STANDARDIZATION SAMPLES IN THE AGE RANGE 5-9 YEARS  
AND 'T' RATIOS

Comparison Groups	Subtest	I	II	III	IV	V	VI	VII	VIII	Total
Total-Sch	MD	1.00	0.65	0.50	2.39	1.60	0.62	2.47	1.78	11.3
	t	4.72	1.80	1.08	6.36	3.66	2.02	7.42	3.27	5.29
	Significance	XX	NS	NS	**	**	*	**	**	**
9 Yr-Sch	MD	2.55	1.66	1.95	3.40	2.16	1.63	3.45	2.98	20.9
	t	10.45	4.43	4.79	8.35	4.76	4.98	9.91	5.40	9.24
	Significance	**	**	**	**	*	**	**	**	**
8 Yr-Sch	MD	1.74	1.10	1.20	3.07	2.28	1.22	3.18	2.69	17.0
	t	7.40	2.53	2.53	7.64	5.10	3.74	9.23	4.88	7.72
	Significance	**	*	*	**	**	**	**	**	**
7 Yr-Sch	MD	0.84	0.70	0.20	2.45	1.51	0.44	2.31	1.77	10.8
	t	3.67	1.89	0.04	6.14	3.40	1.38	6.65	3.18	4.87
	Significance	**	NS	NS	**	**	NS	**	**	**
6 Yr-Sch	MD	0.14	0.08	-0.22	0.81	-0.77	-0.17	1.81	1.07	6.0
	t	0.61	0.21	0.46	0.20	1.72	0.50	5.20	1.92	2.7
	Significance	NS	NS	NS	NS	NS	NS	*	NS	**
5 Yr-Sch	MD	0.22	0.31	0.82	1.25	0.33	-0.33	1.48	0.91	2.0
	t	0.92	0.82	1.70	3.09	0.71	1.03	4.18	1.63	0.0
	Significance	NS	NS	NS	**	NS	NS	**	NS	NS

Anyway, the comparison of the performance of hospitalized schizophrenic on CF Scale with the normative group as indicated on Table 8 is quite revealing and interesting.

This particular investigation has revealed that the schizophrenics get a significantly low score on all the subtests of CF, except II and III as compared to the total standardization sample, including all the age-groups from 5 to 9 years. When comparisons were made separately with each of the age-groups, it is interesting to note that the schizophrenic sample gets a

significantly lower score on the subtests at the 9-year and 8-year levels. At the 7-year level, there is significant differences on all the subtests except Tests II and III; at the 6-year level, the schizophrenics get a significantly lower score on one test only (Test VIII). Still they get a significantly lower score on the total score on CF. But at the 5-year level schizophrenics get slightly higher score on four tests, but the difference is not significant. But on Test IV and Test VII schizophrenics get a significantly lower score than the 5-year-olds. However, on the total score, the differ-

ence is not significant. So, it appears that one is justified to conclude that schizophrenic deterioration is only up to the 6-year-olds level, but may not be lower than that, schizophrenics, at least in the present investigation, intellectually are similar to the 5-year-olds, since the higher age-group of children get a significantly higher score on CF Test.

The present investigation not only supports the clinical validity of the CF Scale 1, but also indicates the possibility of the use of CF Scale 1 to measure intellectual functioning in the schizophrenics. A further analysis in relation to the various subtests of CF Scale 1 may bring in more interesting information.

#### SUMMARY

1. After pilot studies and item analysis in relation to CF Intelligence Test, Scale 1, normative data was collected on 1,089 boys and girls in the age range 5-9 years from Hindu and Tribal populations of Ranchi.
2. Analysis of variance of the 20 samples varying in age, sex, and culture ( $5 \times 2 \times 2$ ) on the eight subtests of Scale 1 and test of mean differences revealed that with age, scores consistently increase and significant differences in test scores based on sex and culture were only a few. This was the basis to pool the data and to consider age alone as the variable for normative studies.
3. Test of normality at each age level indicated normal distribution of scores.
4. Conversion tables from raw scores

to IQ were prepared for the original as well as the adapted subtests, so that any combination of tests could be used for the Indian situation and cross-cultural comparisons could be possible.

5. Studies of reliability and validity on separate small samples indicated (a) test-retest reliability is high (.90), (b) correlation with teachers' rating and performance in mathematics and terminal examination are high (.64-.85), (c) institutionalized patients with intellectual deterioration score significantly lower score than normative sample at 8 or 9 years.
6. The present research is a more or less a wholesome effort in adapting CF Intelligence Test, Scale 1, to Indian conditions, more exactly, to middle-class culture of Hindi-speaking region of India.

#### REFERENCES

- CATTELL, R. B. & CATTELL, A. K. S., *IPAT Handbook, C. F. Intelligence Test Scale-2*, 1949
- CATTELL, R. B., *C. F. Intelligence Test, Scale 1*, IPAT, 1950
- CATTELL, R. B., CATTELL, A. L. S., *Handbook, C. F. Intelligence Test Scale-3*, IPAT, 1959
- FOWLER, W. L. (1955), "Measuring Intelligence with the Culture-Fair Test", *Manual IPAT*, 1973
- MACARTHUR, R. S. and ELLEY, W. B., "The Reduction of Socio-economic Bias in Intelligence Testing", *Brit. J. Educational Psychology*, 33, 107-119, 1963
- RAO, S., "Use of Culture-Fair Intelligence Tests in India", *Ind. J. Psychol.*, 40: 61-66, 1965
- RAO, S., "A Useful Intelligence Test for High School and College Students in India", *India J. Psychol.*, 40: 19-26, 1965

# Impact of Sociological Factors on the Teaching Ability in the Classroom

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IT IS WIDELY accepted that the destiny of a nation is determined in her classrooms. Educational institutions are the production centres of the manpower needed for the industries, the defence, and other areas of activities in the country. If the persons engaged in these areas are to function effectively, then the educational system must be a sound one suited to the socio-economic conditions of the country.

Any scheme of education needs a team of good teachers if it is to be implemented effectively. The role of the teacher in education and in the society is changing day by day. According to the modern concept he is not only to be a classroom

teacher but should be a community leader also.

Teaching is an art and it is said that artists are born and not made. Though this statement is not fully accepted today, one has to agree that the ability in teaching has its roots in the personality of the individual. Education aims at bringing in behavioural changes. Man's behaviours are conditioned by his psychological as well as sociological environments. Certain qualities which are essential for a good teacher are better developed in certain environments. Hence it is worthwhile to study the impact of certain sociological factors on the teaching ability of teachers in the classroom.

Today many people, including the teachers, say that one of the reasons for the poor quality of our education is the poor quality of the teachers. Humayun Kabir<sup>1</sup> has stated "The low social status of teachers has also contributed to the loss of idealism among pupils. Children read in books about the respect that is due to teachers and contrast it with the actual state of affairs. This has induced in them a tendency to accept as natural even glaring discrepancies between profession and practice."

The above comments do not fit in with the traditions in this country. In ancient India teachers led very simple life. They lived in forests in humble condition. The pupil had to beg alms for his own subsistence and for the teacher's. Yet those teachers were known as great teachers—"the Gurus". This had created a necessity to study the 'Impact of Certain Sociological Factors on the Teaching Ability in the Classroom'.

### *Scope and Limitations*

The study has been limited to the secondary school teachers in Trichur educational district. Of the various sociological factors the following have been studied.

1. Socio-economic status of the teacher
2. Socio-economic status of their parental family
3. Age
4. Sex
5. Caste

### *The Sample*

Since the study is intended to be generalized for the secondary school teacher, equal representation was given to government school teachers and private school teachers, to the rural and urban areas and to the male and female teachers. For the present study the sample size was fixed at 200.

### *Hypothesis*

The study proceeded on the following hypotheses

1. Teaching ability is not positively related to socio-economic conditions
2. Teaching ability is not affected by the sex of the teacher
3. Teaching ability is not influenced by the age of the teacher.
4. Teaching ability is not affected by the caste of the individual.
5. Teaching ability is not affected by the type of the management of the school.

### *Tools and Procedure*

Data for the study were collected through a questionnaire and rating scales.

I. SOCIO-ECONOMIC STATUS AND OTHER PERSONAL DATA. The data on the above items were collected through a questionnaire. For this purpose the socio-economic status scale of Kuppaswamy was used with necessary modifications. The data sheet was given to the teacher included in the sample size. The data were collected in person by the principal investigator and the research assistant.

<sup>1</sup>Kabir, Humayun, *Education in New India*, George Allen and Unwin Ltd, London, 1961, pp 151-153



**II ASSESSMENT OF TEACHING ABILITY** A proforma for evaluating the teaching ability of the teacher has been prepared after consulting the evaluation practices followed in the teacher training institutions in the state for the evaluation of the classes of the trainees. Similar studies carried out in the Department of Education, University of Kerala, were also consulted. An evaluation sheet was also prepared. The headmasters evaluated the classes of the teachers.

**III. PUPIL'S RATING SCALE.** As pupils are the best evaluators of teaching ability, a pupils' rating scale for evaluating the teaching ability of the respective teachers was prepared. This followed the three-point rating procedure.

#### *Procedure*

The principal investigator and the research assistant visited the schools, explained the purpose of the study and the method of filling the data sheet. The data sheets were then given to individual teachers and the data were collected.

For the evaluation of the teaching ability the headmasters were approached. They were told how to evaluate the classes. The proforma and the scoring sheets were handed over to them. The evaluation of the classes was to be kept strictly confidential.

In the case of the socio-economic status, as the weights given by Kuppuswamy were outdated, new norms developed by Dr. K. Sivadasan Pillai were accepted. The weights and classification assigned by him are given below.<sup>2</sup>

<i>Education</i>	<i>Wt</i>	<i>Occupation</i>	<i>Wt</i>	<i>Income per month (Rs.)</i>	<i>Wt</i>
Master's degree	10	Professional	10	above 1000	10
Professional degree and above					
Bachelor's degree	8	Semi professional	8	751-1000	8
Pre-degree, Pre-University, etc.	5	Skilled workers	7	501-750	6
S S.L.C	4	Semi skilled workers	4	301-500	4
Up to Std. VII	2	Unskilled workers, labourers	2	101-300	1
Literate	1	Unemployed	0	Below 100	1

<sup>2</sup>Pillai, K.S., *A Comprehensive Socio-economic Scale for Researchers, Studies in Education*, Kerala University, Department of Education, Trivandrum, 1974, pp 31-36

*Classes*

Upper class —	Above 25 points
Upper middle class —	18-25 points
Lower middle —	10-17 points
Lower class —	below 10 points

The weights and classes have been recommended for both the urban and the rural areas.

The teaching ability was assessed by the headmasters based on the following items.

1. Subject-matter competence
2. Expression
3. Questions and answers
4. Class management
5. Use of aids
6. Methods
7. Learning outcome.

For each of these seven items except the item, 'use of aids', a score of 15 points is given. For 'use of aids' the score assigned is 10. The weights were assigned on the basis of expert opinion. The headmasters assessed the teaching ability of the individual teacher on the basis of the criteria sheet given to them.

The pupil's rating scale was administered by the research assistant. After explaining necessary points to the pupils, the rating scales were distributed to pupils. Fifteen to twenty pupils rated each individual teacher. The average score was taken. The rating scale consisted of thirty-three items which are closely associated with teaching ability in the classroom. It is a three-point one and the total score comes to 99. The rating was later scored as per scoring procedure. All precautions were taken by the investigator to avoid fear and doubts of the

pupils so that the scores obtained are reliable and valid.

For a comparative study of different groups of teachers, the sample was grouped as female teachers and male teachers, departmental teachers, and private school teachers, rural teachers and urban teachers. These three groups were compared in the matter of their socio-economic status and teaching ability.

Teaching ability has been compared on the basis of mean value and the difference in the means was tested for significance. A correlation study was attempted to find the relation between socio-economic factors and teaching ability.

*Significant Related Studies*

Fatter and Howsam<sup>3</sup> reviewed the research on predictor criteria and teacher effectiveness and concluded that, 'research has failed to substantiate link for such characteristics as intelligence, age, experience, cultural background, socio-economic background, sex...' There were slight positive correlation shown between scholarship and teaching effectiveness. They found the student rating to be more consistent. They have remarked that supervisor's rating seems to be highly biased. Lawler<sup>4</sup> has stated "Principals were not good raters of teacher efficiency". Coffman<sup>5</sup> has remarked that "The kind of people one have in teaching necessarily affects the kind of teaching one gets... Difference due to social class,

<sup>3</sup>Ebel, L. Robit, et al, *Encyclopedia of Educational Research*, The Macmillan Co. Ltd., London, 1969, p. 1424

<sup>4</sup>Gage, N.L., *Handbook of Research on Teaching*, Rand McNally and Co., Chicago, 1965, p. 717

<sup>5</sup>*Ibid*, p. 725

to economic station. must likewise be important factors affecting public opinion of the merits of the teacher and his work ...' He continues, "low economic situation ... limits the opportunity for academic and professional training, which in turn affects the development of cognitive attributes". Herda<sup>6</sup> found no difference between the male and female teachers in teacher effectiveness as measured by a teacher's examination and by pupil's ratings. Oden Welles found a slight positive correlation between the age and teacher effectiveness. There are a large number of similar studies in the West.

In India, Gupta<sup>7</sup> came to the conclusion that efficiency in teaching increases with greater academic qualification and training. He also found that good housing conditions affect efficiency favourably. Ansari<sup>8</sup> studying the teacher efficiency of women teachers had stated that the size of the family plays an important role in determining teacher efficiency. Nair<sup>9</sup> found that academic achievement alone is not a good predictive criterion for teaching success, and that socio-economic status has got a low positive correlation with teaching ability. Ramakrishna Pillai<sup>10</sup> studied 'Teacher qualities' and has given a list of qualities. According to the studies the most important qualities of a teacher are, (i) ability to make his lesson interesting, (ii) impar-

iality, (iii) kindness, (iv) ability to maintain discipline, and (v) ability to motivate the learner. Saratchandria Ray<sup>11</sup> studied teacher characteristics as perceived by the pupils and teachers. He has given a list of qualities of which some are given below

1. Knowledge of subject-matter
2. Sense of responsibility
3. Ability to teach
4. Must come to the class prepared
5. Regularity and punctuality
6. Sincerity in his work
7. Teach with due regard to the pupil's comprehension.

### *The Data*

The data were collected from 200 teachers in the secondary schools in Trichur District. The distribution of teachers is as follows.

Table 1  
DISTRIBUTION OF TEACHERS

	Men		Women		Total
	Govt.	Private	Govt.	Private	
Rural	25	25	25	25	100
Urban	25	25	25	25	100
Total	50	50	50	50	200

### *Age*

From Table 2 it is seen that the majority of teachers belonged to the age-group 30-44. It also shows that out of the 200 teachers only five are below the age of 25 and three above the age of 55.

<sup>11</sup>Raj, Saratchandria, *Teacher Characteristics as Perceived by Pupils and Teachers*, unpublished M. Ed. Thesis, Kerala University, 1971

<sup>6</sup>Ibid., p. 725

<sup>7</sup>Adaval, S B., (ed), *Third Indian Year Book of Education*, N.C.E.R.T., New Delhi, 1968, p. 140

<sup>8</sup>Ibid., p. 141

<sup>9</sup>Nair, S R., "Academic Achievement and Social Background as Predictors of Teacher Effectiveness", *Teacher Education*, Vol. VI, No. 4, July 1962, Delhi, pp. 17-22

<sup>10</sup>Pillai, K., Ramakrishna, *A Study of Teacher Qualities Rated by Pupils in Some Secondary Schools in Kerala*, Unpublished M. Ed Thesis, Kerala University, 1966

Table 2  
DISTRIBUTION OF TEACHERS  
ACCORDING TO THEIR AGE

Age	No
20—24	5
25—29	25
30—34	32
40—44	52
45—49	22
50—54	14
55—59	3
Total	200

### *Socio-economic Status*

As per the scores obtained on the modified norms developed for Kuppaswamy's socio-economic status scale, the sample for the present study belongs to the upper class, upper middle class and lower middle class. None of them was found to be in the lower class. Their distribution is given in Table 4

Table 3  
CLASSIFIED AGE DISTRIBUTION OF THE TOTAL SAMPLE

Age	Govt. School Teachers				Private School Teachers				Total
	Urban Men	Urban Ladies	Rural Men	Rural Ladies	Urban Men	Urban Ladies	Rural Men	Rural Ladies	
20—24	0	0	0	1	0	3	0	1	5
25—29	0	2	2	2	2	9	3	5	25
30—34	2	3	1	5	5	6	6	4	32
35—39	4	3	7	9	7	2	5	10	47
40—44	8	10	8	7	8	5	3	3	52
45—49	7	6	3	0	2	0	3	1	22
50—54	3	1	3	2	1	0	4	1	14
55—59	1	0	1	0	0	0	1	0	3
Total	25	25	25	25	25	25	25	25	200

The classified age distribution of the sample is given in Table 3. It is seen that a good number of the private school teachers belong to the lower age-group whereas a comparatively good number of the government school teachers belong to the upper age and group.

Table 4  
CLASS DISTRIBUTION OF THE SAMPLE

Class	No.
Upper class	27
Upper middle class	164
Lower middle class	9
Total	200

The classified class distribution of the total sample is given in Table 5.

**Table 5**  
**CLASSIFIED CLASS DISTRIBUTION OF THE TOTAL SAMPLE**

Class	<i>Govt School Teachers</i>				<i>Private School Teachers</i>				Total
	Urban Men	Urban Women	Rural Men	Rural Women	Urban Men	Urban Women	Rural Men	Rural Women	
Upper class	5	9	8	0	2	0	3	0	27
Upper middle class	19	16	16	25	22	24	19	23	164
Lower middle class	1	0	1	0	1	1	3	2	9
Total	25	25	25	25	25	25	25	25	200

### *Teaching Ability*

The distribution of the sample according to their teaching ability as assessed by the headmasters is given below.

**Table 6**  
**DISTRIBUTION OF THE SAMPLE ACCORDING TO THEIR TEACHING ABILITY AS ASSESSED BY THE HEADMASTERS**

<i>Score</i>	<i>No.</i>
95—99	1
90—94	3
85—89	3
80—84	6
75—79	12
70—74	22
65—69	23
60—64	50
55—59	34
50—54	24
45—49	16
40—44	4
35—39	2
Total	200

Here it may be noted that out of a sample of two hundred teachers 120 scored more than 60 per cent. This shows that the teachers are in general good in

teaching as assessed by the headmasters. Here it may be recalled that in the case of their socio-economic status 191 teachers were in the upper middle class or upper class. Thus it seems that the socio-economic status is related to the teaching ability as seen from the headmasters' assessment.

**Table 7**  
**DISTRIBUTION OF TEACHERS ACCORDING TO THEIR TEACHING ABILITY AS RATED BY PUPILS**

<i>Score</i>	<i>No.</i>
95—99	3
90—94	12
85—89	33
80—84	51
75—79	44
70—74	21
65—69	22
60—64	3
55—59	8
50—54	3
Total	200

In the pupils' rating there is no one who has secured a score below 50. Hence the inference that teachers in this district are generally good at teaching is strengthened.

A comparative study of different groups of teachers and correlation studies were also attempted. The conclusions are given below.

### Conclusions

The study aimed at finding the impact of certain sociological factors like family background, caste, religion, etc on the teaching ability of teachers. The study was confined to the secondary teachers of Trichur District. The teaching ability was assessed both by the headmasters and the pupils. The teachers' socio-economic conditions were ascertained through a questionnaire. Analysis of the data yielded the following findings.

(1) The teachers' parental socio-economic conditions have a negative influence on the teaching ability, i.e. teachers from the upper strata of the society are not equal to those of the lower strata in regard to teaching ability, the latter having the better scores.

(2) The type of management of the schools where the teachers work is a factor influencing their teaching ability, the private school teachers in general are found to have better teaching ability than the government school teachers.

(3) Sex is not a factor affecting the teaching ability.

(4) The locality of the schools has no significant influence on the teaching ability.

(5) There is some positive relationship between the age and teaching ability as experience plays a dominant role in effective teaching.

(6) Caste is not a factor affecting teaching ability, so is the case with religion.

### REFERENCES

- ADAVAI, S B (ed), *The Third Indian Year Book of Education*, N C E R T, New Delhi, 1968
- BUCH, M B. (ed), *A Survey of Research in Education*, C A S I, Baroda, 1974
- DOUNIE, N M. and HEATH, R W, *Basic Statistical Methods*, Third Edition Harper and Roe, New York
- EBEL, L ROBERT *et al.*, *Encyclopaedia of Educational Research*, The Macmillan and Co., Ltd, London, 1969
- GAGE, N L, *Hand Book of Research on Teaching*, Rand McNally and Co, Chicago, 1965
- GARRITT, F HENRY, *Statistics in Psychology and Education*, Vakils, Felfer and Simons Private Ltd, Bombay, 1969
- GOOD, V. CARTER and SCATES, E DOUGLAS, *Methods of Research Educational, Psychological, Sociological*, Appleton Century-Crofts, New York, 1954
- HAYMAN, L. JOHN, *Research in Education*, Charles E Merrill Publishing Co., Columbus, Ohio, 1968
- KABIR, HUMAYUN, *Education in New India?* George Allen and Unwin Ltd, London, 1961
- KUPPUSWAMY, B., *Manual of Socio-Economic Status Scale*, Manasayan, 32, Faiz Bazar, Delhi, 1962
- NAIR, S R, *The Socio-Economic Status and Family Pattern of Graduate Teachers in Trichur District*, Unpublished doctoral thesis, Kerala University, 1970
- PILLAI, K. RAMAKRISHNA, *A Study of Teacher Qualities Rated by Pupils in Some Secondary Schools in Kerala*, Unpublished M. Ed thesis, Kerala University, 1966
- RAJ, SARATCHANDRA, *Teacher Characteristics as Perceived By Pupils and Tea-*

chers, Unpublished M Ed. thesis, Kerala University, 1971

RUIELA, S P., *Sociology of the Teaching Profession*, N C E R T., New Delhi, 1970

TRALERS, M N Robcit, *An Introduction to Educational Research*, The Macmillan Co., New York, 1964

*Teacher Education*, Vol VII, No. 1, Delhi, 1972

*Teacher Education*, Vol VII, No 4, Delhi, 1973

*The British Journal of Educational Psychology*, Vol XXXVI, Part 2, London, 1966

*The British Journal of Educational Psychology*, Vol 38, Part 2, London, 1968

# JOURNALS AND REPORTS

*Education and Psychology Review*, Vol XII Nos 1-2, Baroda, 1972

*Journal of Experimental Education*, Vol XXIII, No 1, Wisconsin, 1954

*N I E Journal*, N C E R T., New Delhi, 1960

*N I E Journal*, N.C.E.R.T., New Delhi, 1972

*Studies in Education*, No 6, Department of Education, University of Kerala, Tiruvandium, 1974

Government of India, *Report of the Education Commission (1964-66)*

Government of India, *Report of the Secondary Education Commission (1952-53)* □

# Personality Characteristics of Creative Engineers : A Review of Researches

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ENGINEERING is a profession—an art of action and synthesis—and not simply a body of knowledge. Its highest calling is to invent and innovate. Engineering education should encourage students to strive for the mastery of the fundamentals, the discovery of the relatedness of things, and the cultivation of professional excellence. But all the while it should also be a creative experience, stimulating the imagination of the students and helping them to prepare themselves for the unresolved contests and the new challenges of an imperfect world (De Simone, 1968)

Charles Draper, describing the characteristics of the creative engineer, lists the ability to recognize key problems, bring relevant knowledge to bear upon them, conceive effective solutions and carry these through the innovative process. Engineering education should nurture all these traits

The National Conference on Creative Engineering Education held at the University of Illinois (1965) recommended that the development of the inventive and innovative potential of engineering students should, therefore, be an active concern of industry, government, the universities and in larger perspective, society as a whole. Bladé (1963) observes

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\*The author is grateful to Dr M. K. Raina for making available the literature, and reading the final draft of this paper.



that "there is little notion of the creative engineer in the minds of the public, although the image of the creative scientist is widespread...engineers are anonymous".

Another conference of equal importance, if not more, held at Woods Hole, Cape Cod (De Simone, 1968) examined the creative process of invention and innovation, the opportunities for encouraging creative activities in the engineering schools, and possibilities for developing and supporting creative engineering education. A careful analysis of the proceedings reveals that creative engineering is one of the urgent needs of a country. This need can be fulfilled only if the engineering institutions instill and nurture such qualities, as described earlier, in their students through their curricula, instructional methodology and a general creative institutional ethos.

In a similar context, Professor Swami (1975), Director, Indian Institute of Technology, New Delhi, stressed that good engineering and technical education should develop the creative abilities in engineering students for tackling unforeseen problems. But unfortunately, the engineering educators as a group have not yet been concerned with the problems of creativity. For the development of creativity in young engineers, the engineering educators should have an awareness developed on the basis of researches in the distinguishing characteristics of creative engineers and the conditions under which the engineering creative behaviour can be developed. Application of these research findings in an instructional programme of engineering education will contribute immensely to the development of creativity in the engineers. In this paper an attempt has been made to review researches conducted on the

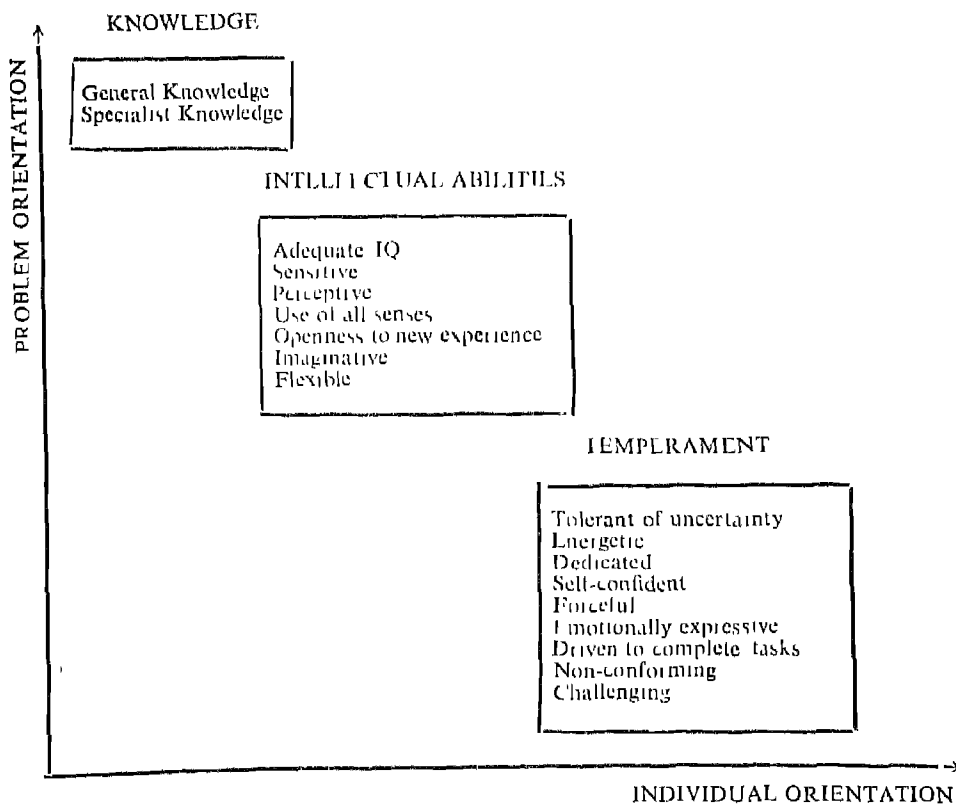
personality characteristics of creative engineers

#### *Need for Research in Engineering Creativity*

Creative engineering has been defined as an insurance against capital loss. The needs of the future are tremendous and vision to plan that future is a commodity of even greater significance to the engineer today than it has ever been in the past (Rosen, 1958). Engineering today is being challenged to prepare the students to solve the future unknown problems. This challenge can be met only by selecting the potentially creative students as freshman engineers, restructuring the instructional programme of engineering education for developing creative talent among those preparing for engineering profession and developing teaching strategies for divergent thinking. All these changes can be introduced confidently only after having considerable researches in the field of creativity in engineering, especially in the Indian settings.

Even though an engineer may have a high level of intelligence or knowledge of facts or information, a creative use of his intelligence and background will depend on certain personality factors. Therefore, the study of their personality in relation to creativity in engineering is not only highly desirable but essential as well. The importance of all these three factors have been shown by Whitfield (1975) in the figure on p. 28.

A review of the studies conducted in the field of creative engineering reveals that there is a serious dearth of research studies on qualities, characteristics and personality factors of creative engineers. Otherwise the findings could be applied in selecting proper type of students, deve-



The above figure clearly shows the importance of various factors in the emergence of creativity. Qualities of temperament and personality are, however, central.

developing enriched curricula, modifying teaching methods in engineering institutions for turning out creative, inquisitive and innovative engineering graduates.

#### *Studies on Engineers*

A review of the researches reported in *A Survey of Research in Psychology* (Mitra, 1972) shows that quite a good number of studies have been conducted in India on the traits of successful and unsuccessful engineering students as well as engineers. Pal (1968b) has made an elaborate personalistic study of the students of engineering, law, medicine and

teacher-trainees and determined their value patterns (Pal, 1967a), personality needs (Pal, 1968a), and personality adjustment (1968c). Sinha and Misra (1961a, 1961b, 1963) have made a comprehensive study of sociological and psychological factors in success in engineering. Misra (1962) made a study of the non-intellectual factors and success in engineering education. Pestonjee and Akhtar (1969) analysed the occupational value preferences and income aspirations of the engineering students and teacher-trainees, using Centre's Job Value Cards. But no study has been reported in it on creativity in engineers.

*Studies on Creative Personality in Engineering*

The studies mentioned above have tried to investigate the personality characteristics of engineers in general. Recently the subject of creative engineering has gained a pivotal position in the field of engineering. Blade (1963) mentions in his article on 'Creativity in Engineering' that there is a growing concern by government and industry that our engineers be creative. However, the educators as a group have not yet been concerned with the problems of creativity. Identification of creative talent and its stimulation in the classroom are not yet recognized as the tasks of engineering educators.

Buhl (1958) in his report on 'Engineering Creativity: Qualities of the Creative Engineering Students' attempted to identify and understand the creative engineer, differentiate the highly creative individuals from the less creative ones, and determine the attributes which appear pertinent to creativity. A group of 167 first-term freshman engineers were used as subjects. The results showed a close correlation between creativity and scholastic achievement at the end of the college freshman year. Some correlation was found between creativity and mental ability as measured by the ACE test. It was pointed out, however, that a high mental potential does not necessarily ensure a high creative ability even though an individual with high mental potential has a greater opportunity to exercise his creative ability. Creative individuals were found to differ significantly from the non-creatives in motivation and freedom of expression.

Studying the correlates of technical and scientific productivity, Zelst and Kerr

(1951) tried to investigate the relationships of a group of variables like attitudes, working habits, practices and technical and scientific productivity (number of publications and inventions-weighted) to scientific and technical creativeness. The data received from 194 scientific and technical personnel were then analysed ignoring the age factor. A number of variables including strength of selflessness of motive and disbelief in equalitarian practices in research groups were found to be significantly related to the scientific and technical productivity of subjects. When the age factor was controlled, the following variables were still found to be significantly correlated to productivity: (i) number of degrees held, (ii) disbelief in equalitarian practices in research groups, and (iii) strong belief in the voluntary determination of deadlines. An analysis of curvilinear relationships suggests that maximal productivity of these subjects is achieved with the optimal conditions of about (a) 28 hours per week of regimented time, and (b) 3.5 hours per day of related but spontaneously voluntary home-work.

A study of industrial analytical and creative personnel designed to explore the characteristics of creative versus analytical engineers was conducted by Whelan (1959). All engineers were rated for performance by their supervisors. Both types of engineers scored about the same on the Creative Thinking Test, tended to have favourable performance ratings from their supervisors, while this was not so for the analytical engineers. The creative group was significantly higher on a dominance scale. No other significant personality differences were discovered.

Taylor (1958), in his report on 'Variables related to creativity and producti-

vity among men in two research laboratories', deals with two studies designed to explore the relation of certain tests and other variables to the creativity and productivity of men engaged in research and development work. A group of 103 electronics engineers and scientists were used in the first study. All subjects were administered a series of five tests including Vocational Interest Blank for Men and the Test for Selecting Research Personnel. An analysis of the results of this study revealed a somewhat higher correlation between the test for selecting research personnel and the descriptive ratings of originality and quality of work than in the previous study.

Research on intellectual characteristics of the creative engineer reveals the existence of a special combination of originality and constructive discontent. Williams (1964) found that factors of problem-sensitivity and idea-fluency were significantly related to both suggestion and adoption rate in the company's suggestion programme.

Creative engineer is characterized by various fluency factors such as flow of ideas, flow of associations, and flow of expressions for stating ideas or solutions. Apart from the intellectual characteristics there are some very well defined motivational characteristics of scientific and engineering creativity. The design engineer who is regarded as creative tends to be more autonomous than others, puts a premium on independence and freedom, and is likely to avoid situations in which others try to dominate or coerce him. Other motivational characteristics include persistency, liking to think, liking to toy with ideas, continual searching for a variety of input experiences, preference for complexity, tolerance for ambiguity, resistance to premature closure and

crystallizing things too early but a strong desire for closure and moving on when conditions seem ready, and independence in thinking but not necessarily in behaviour.

One of the most consistent findings in many creativity studies among scientists and engineers is that the creative personality is perceptually 'open'. This implies a resistance to premature judgement. Faced with something new or different, the engineer searches for flaws, for signs of weakness, or for areas of possible failure.

Tolerance for ambiguity has been found to be one of the important motivational characteristics of the design engineer who is regarded as creative (Williams, 1964). In a substantial article in *University Quarterly*, Snyder (1967) established that the student scientist needs greater sanction and freedom for intellectual risk-taking than his engineer counterpart. This at least raises the interesting possibility that creative solutions or formulations by engineers may involve 'intolerance' rather than 'tolerance' of ambiguity.

Owens (1968) conducting a 1964 follow up study of 1,500 engineering students originally administered four tests of mechanical creativity during 1955 tried to study which personal (non-cognitive) and environmental characteristics facilitated or inhibited the expression of this creativity in the meantime. In 1964 Ss completed inventories of personal and environmental characteristics and the scores were correlated with the creativity criterion. Results from this study broadly suggest that creative person in engineering is cognitively complex and can integrate more inputs than his less creative fellows.

A significant interest in the research

of creativity is witnessed in Czechoslovakia since 1960. Prague Creativity Unit of the Institute for Promotion of Inventions is one of the active centres in this field. One of the diploma thesis conducted by Hlavsa and Landa (1973) made an attempt at determining the relation between aspiration and creativity. The presumption that the technicians from a developmental department of an industrial enterprise rated as more creative would show a higher aspiration level was not found valid.

Hlavsa and Kobylaka (1973) studied the mental states in the creative process with a view to finding personality characteristics as related to the process of creativity in engineers. A questionnaire of 180 questions was developed to measure psychic states and their changes. It was administered individually to 30 engineers (with at least 10 registered patents) and to 30 artists. The following are some of the results specially relevant to this paper as derived out of the said study. During the creative process report that excitement is frequent 78 per cent Ss. A very interesting phenomenon is the expectation of something undefinable stated by 75 per cent of Ss. Over-sensitiveness to outside stimuli is stated by 58 per cent Ss. 83 per cent of the Ss affirm to be more active during the creative process than at other times. Excitement usually occurs before creation starts. After the creation process activity reduction is reported by 55 per cent of Ss. A number of questions indirectly reveal many facts about motivation. Some characteristics of personality also change during the creative process, e.g. self-confidence and self-consciousness are usually either high or moving to and fro, also resoluteness used to be higher or fluctuating. A majority of Ss reported increased aggressiveness and

aggression turned against one's self. A minority of Ss report these characteristics to be sinking due to increased insecurities.

Chalupa (1974) studied creativity in science and technology. The investigator has analysed the characteristics, conditions and forms of creative activities in science and technology. His studies, involving about 300 workers, has been carried out in four research institutes of chemical and textile industries and technical planning and designing institute of communication engineering. He established correlations between various tasks on the one hand, and the results of the psychological investigation, (creativity tests, IQ, years of service, job satisfaction etc.) on the other hand. In contrast to other studies, the investigator has not found any consistent relations between personality and productivity of research workers. The tests of creative thinking correlated positively with the scale of emotional stability.

One of the major interests in creativity personality relationship has centred around value orientation of the creative individuals. Datta (1965) reported a study of 'Value Conflict' in creative Ss. MacKinnon (1962 a, 1963 b, 1965 a, 1965 b, 1967) has made considerable contribution to our limited knowledge of the relation of creativity to personality in engineers, although many of his papers are somewhat inaccessible.

Hall and MacKinnon (1968) in a major study on the personality inventory correlates of creativity among architects (N=124) has conducted multiple step-wise correlation analyses on each of seven personality inventories against the rated creativity of 62 architects from a nationwide sample. The inventories used were

the Strong Vocational Interest Blank, Myers-Briggs Type Indicator; Schutz's FIRO—B, AVL; Gough and Hebrun's Adjective Check List, the MMPI and CPI. Commenting on the results Hall and MacKinnon drew attention to the fact that it is the SVIB which has the greatest ability to forecast the rated creativity of architects. Conversely the MMPI is relatively weak. They found out that architect tends to be less often extroverted in the Jungian sense. Over-simplifying the complicated results it would seem that the intense personal and social interaction required with many clients is not to his liking and he would prefer time for contemplative thought and creative activity. Among MacKinnon's creative architects, 'aesthetic values' were highest with 'theoretical values' almost as high. Among other characteristics of the creative architects were dominance, rather low sociability, freedom from conventional restraints and inhibitions, readiness to admit views that were unusual and conventional, relatively high femininity of interests, and a general level of score slightly higher than the population average on those scales of the MMPI that measure tendencies to measure neurotic or psychotic tendencies such as depression, schizophrenia, hysteria and so on.

### Conclusions

In this paper although attempt has been made to review all the available researches related to personality characteristics of creative engineers but it is not claimed to be all inclusive. After making an extensive study of creativity in engineering, Blade (1963) recommended that research should be continued to identify talented and creative engineers from the

very beginning. In this respect the engineering schools and educators in engineering and technical field have to share greater responsibility to see that creativity is enthused and nurtured in the classrooms. This can only happen more effectively when ample research evidences are made available in such areas as identification, methods of teaching, personality and other characteristics, teaching-learning process, etc. A developing country can march ahead only when its plans are backed by original, creative and talented band of engineers with enlightened vision, wide spectrum of creative ideas and ready to spearhead the forthcoming unknown challenges.

### REFERENCES

- BLADE, M.F., "Creativity in Engineering" Myron A. Coler (ed) *Essays On Creativity in the Sciences*, New York. University Press, 1963.
- BULL, H.R., *Engineering Creativity, Qualities of the Creative Engineering Student*, Department of Mechanical Engineering, Iowa State College, September, 1958.
- CHALUPA, B., *Creativity in Science and Technology A Psychological Study*, University J.G. Purkyne, Brno, 1974.
- DATTA, L., "Value conflict, creativity and the study of values," *Psychological Report*, 1956, 16, 57-58.
- DESIMONE, D.V., *Education for Innovation*, Oxford Pergamon Press, 1968.
- HALL, W.B. and MacKinnon, D.W., "Personality inventory correlates of creativity among architects," *Journal of Applied Psychology*, 1969, 53, 322-326.
- HLAVSA, J. & KOBYLKA, J., "Essay on ascertainment of the typical and generally occurring mental states and mental changes during the creative process," *Cerkoslovenska Psychologie*, 1974, 2, 173-178.
- MISRA, H.K., "Non-intellectual factors and success in engineering education," *Contributions to Psychology*, Patna Ins-

titute for Social and Psychological Research, 1971.

MITRA, S. K , *A Survey of Research in Psychology*, (ICSSR) Bombay. Popular Prakashan, 1972

OWENS, W A. "Cognitive, non-cognitive, and environmental correlates of mechanical ingenuity," *Journal of Applied Psychology*, 1969, 53, 179-208.

PAL, S K , "Personality patterns of engineering, law, medical and teacher-training students: A Comparative study", *Journal of Social Psychology*, 1968b, 74, 287-288.

PESTONJEE, D M and AKHTAR, S S., "Occupational values, perceptions and income aspirations of engineering and teacher training students," *Indian Psychological Review*, 1969, 5 (2), 131-135

ROSEN, C G A "In quest of engineering creativeness," *Journal of Engineering Education*, 1958, 48, 917-922.

SINHA, A K.P (ed ) *et al Contributions to Psychology*, Institute for Social & Psychological Research, Asia Publishing House, 1971.

SINHA, D and MISRA, H K , "Qualities desirable for engineering students and profession (Part I. teachers' sample)," *Journal of Psychological Researches*, 1961a, 5(1), 1-12.

SINHA, D and MISRA, H.K , "Qualities desirable for engineering students and profession," (Part II. students' sample), *Journal of Psychological Researches*, 1961 b, 6.

SINHA, D. and MISRA, H.K., "Qualities desirable for engineering students and profession," (Part III : Comparison of teachers' and students' sample), *Journal of Psychological Researches*, 1963, 7, 16-20

SNYDER, B , "Creative students in science and engineering," *Universities Quarterly*, 1927, 21, 205-211.

SWAMI, N.M., Welcome address, *Proceedings of the Golden Jubilee Session of Association of Indian Universities*, 1975 xi-xiii.

TAYLOR, DONALD W , Variables related to creativity and productivity among men of two research laboratories," Report prepared under Project NR 150-149 and supported by Contract N 60 nr 25125 between Stanford University and the office of Naval Research, 1958.

VAN ZELST, RAYMOND H., and KERR, WILLARD A , "Some correlates of technical and scientific productivity," *Journal of Abnormal and Social Psychology*, 1951, 46, 470-475.

WHELAN, KENNETH J., "A study of industrial analytical and creative personnel," Master's Thesis, Western Reserve University, 1959

WHITFIELD, R , *Creativity in Industry*, London Penguin, 1975

WILLIAMS, FRANK E , "Creativity in engineering education," *Personnel Administration*, 1966, pp. 22-27. □

# Elementary School Building for Efficiency and Economy

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THE SCOPE of this paper is to consider various forms and shapes of classrooms that could house different uses for imparting knowledge and intimate teacher-taught participation, leading to space economy which in turn will reduce the cost, without being detrimental to environment.

## *Introduction*

It is at a elementary school, where the child spends the most formative period of his life. Hence its environment should reflect the country's aspiration of shaping its future citizenary.

The task, however, is Herculean for a poor nation like India. Hence, it calls for intensive research in its all encompassing facets.

## *Background*

Ancient India developed the Ashram type of rural campuses (Taxila, Nalanda, etc) organized under the supervision of great sages (e.g. Vishwamitra, Sandipani, etc.) This had two distinct advantages, namely, undisturbed studies, peaceful environmental set-up conducive to learning, and an awareness of the dignity of



labour as various types of works, for instance, cleaning, cooking, having wood and building, etc were done by the scholars. The shift from the rural to urban educational campuses came in the wake of the Muslim rule in India, in Jaunpur, Avanti, Bijapur, Deoband, Kashi, Poona, etc. During the British rule, the then Government was interested in dissolving the traditional native system and introducing their own for the purpose of getting mental slaves and supporters for continuing their suzerainty. These overlords were successful in their aims and objectives by producing a host of job-seeking mental slaves. They were clerks, administrators, soldiers, commanders, teachers, technicians, lawyers, doctors and public men. After Independence, and the framing of constitution and its new educational policy, the problems of building schools demanded close attention. The Ministry of Education, Ministry of Works, Housing and Supply, and the Planning Commission all formed panels to study the

problems of school buildings either in terms of room-sizes, site areas and the need for cost reduction. The trend of centralization in policy making in all the fields of education has been the most dominating note of the 'Plan Period'.

The advancement in education as indicated in the census reports for the period 1940-1970 indicate a phenomenal rise in the school enrolments after independence.

<i>Year</i>	<i>School Enrolment</i>
1940-41	62,77,800
1945-46	1,37,24,189
1950-51	2,43,90,000
1970-71	9,75,00,000
1980-81	12,80,00,000 (projected)

According to the Fourth Five Year Plan, the enrolment figure stood at around 69.5 million in elementary schools alone and the number of schools required was 3,47,500.

The space required per student in an average classroom varies in different countries:

<i>Country</i>	<i>Higher grade</i>	<i>Lower grade</i>
U.S.A	26 sq. ft. (2.4 sq. m)	30 to 40 sq. ft. (2.78 to 3.7 sq. m)
U.K.	16 sq. ft. (1.4 sq. m)	20 sq. ft. (1.8 sq. m)
South Africa	15 sq. ft. (1.39 sq. m)	20 sq. ft. (1.8 sq. m)
India	12 sq. ft. (1.11 sq. m)	15 sq. ft. (1.39 sq. m)

The space usually made available to each student in India varies in relation to different areas inside a school:

<i>School</i>	<i>Class</i>	<i>Lav.</i>	<i>Hall</i>	<i>Lecture</i>	<i>Special room</i>	<i>Area per student (sq. ft. / sq. m)</i>
Junior Basic	15	1	3.5	1	3	= 23.5 + circulation for 150 students (2.185 sq. m + Cir.)
Sr. Basic	12	1.5	3.5	1.25	6	= 24.25 + circulation for 120 students (2.25 sq. m + Cir.)
High School	12	2	3.5	1.25	30	= 49 + circulation for 120 students. (4.55 sq. m + Cir.)

This is comparatively low when compared to the space allotted for students in the U.S.A., U.K. and other countries. But we cannot afford even this much of space and hence probing researches are required in this field

<i>Space classification in an elementary school</i>	<i>Essential in Indian context</i>
(a) Instruction : This includes classrooms, crafts room and related spaces	Classroom
(b) Administration : This includes the space for the headmaster, teachers and the clerical staff.	Headmaster should have his own office room
(c) Circulation It includes corridors, lobbies, staircase.	Should be avoided as far as possible
(d) Special space	
(i) Storage, toilets, lockers and other service equipments.	Storage in classrooms and detached urinals
(ii) Auditorium, gymnasium, library, cafeteria, kitchen.	Open air library activities
(iii) Open space (this includes play spaces, garden spaces, equipment, open air classrooms).	Open space

### OBSERVATIONS

#### *Survey*

An observation survey of 50 schools in different parts of the country was conducted. The samples included a wide range of school buildings from the pitiable schools in Saliyar village (Saharanpur district), the basement classrooms in Sanatan Dharam School at Roorkee to the posh American School in New Delhi. However, in most of the average school buildings the following shortcomings were found.

1. Classrooms are not of appropriate size,
2. Insufficient ventilation and light,
3. Insufficient play areas and open spaces,
4. Lack of storage facilities,
5. Lack of laboratory facilities.

The number of pupils is frightfully

high and the required financial outlay is staggering.

The following areas require serious research work

1. Space economy (full utilization of space and economy achieved in respect of classroom shape),
2. Combination of classrooms formed How to achieve a school form with efficient use of space;
3. Time Table and shift study adjustment;
4. Multipurpose hall and multiple use of space;
5. Furniture, fixtures, fittings of classrooms;
6. Play areas equipment, and
7. Laboratories.

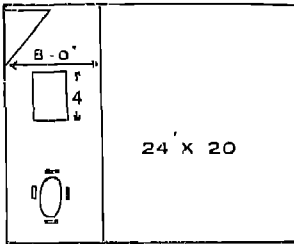
The areas chosen by the authors :

1. Space economy with respect to classroom—form and function;

2. Combination of classrooms and use of maximum space;
3. Time table and shift adjustment;
4. Construction and materials. Materials and method of constructions are suggested

Comparative study of different shapes of classrooms in terms of space economy :

Generally, the rectangular shape of the classroom is adopted which is  $24' \times 20'$  with the accommodation of 40 students in the Indian context (12 sq. ft./student, 1.25 sq. m/student).

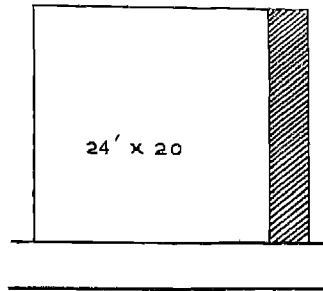


As shown in the plan of the classroom, the teacher sits on one side of the classroom covering an area of 20 sq. ft. (25 sq. m.), only out of  $(20 \times 8') = 160$  sq. ft. (16 sq. m) area of this classroom which is used generally for the board work, the teacher's space and sometimes a reading table is placed at one corner of the classroom. The rest of the area of the classroom could generally be used for formal teaching (lecture), but by special designing of the furniture, this space could easily be used for informal teaching (discussions) and tutorial (group learning). If we reduce the area on the teacher's side (i.e. reducing length out of 20' width of the classroom), it takes the shape of a wedge and does not affect the normal working of the classroom with a rectangular shape. The redundant space is reduced and thus making the built-up area smaller than the rectangular one, leading to economy. This shape focuses

the attention of the students towards the blackboard and is acoustically better than the rectangular shape. The other shapes, i.e. pentagon, hexagon, circle and quarter circle have been adopted for this purpose and their analysis shows that these are comparatively better than the rectangular one.

#### RECTANGLE

- (a) Verandah on the larger side  
 Wall area =  $24 \times 1\frac{1}{2} + 20 \times 9'' + 24'9'' \times 6'9''$   
 $= 36 + 15 + 167 = 218$   
 $= 218$  sq. ft. + circulation  
 (20 26 sq. m + cir.)



Total area of classroom  
 $= 480$  sq. ft. (44.60 sq. m)  
 % of total area  

$$= \frac{218 \times 100}{480} = 45\% \left( \frac{20.26 \times 100}{44.60} \right)$$
  
 $= 45\%$

#### ADVANTAGES

- (i) More area for side lighting.
- (ii) Left light can be easily had.
- (iii) It can be arranged in all the system.

#### DISADVANTAGES

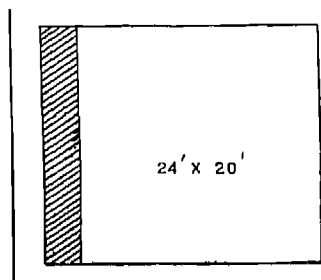
- (i) Longer corridor (circulation)
- (ii) Waste of space as compared to trapezium
- (iii) Costly.

(b) But if we take verandah on short side

Here circulation space = Wall areas  
comes only 186 sq. ft.

$$\% \text{ of total area} = \frac{186 \times 100}{480}$$

$$\frac{(17.28 \times 100)}{44.60} = 38.75\%$$



#### ADVANTAGES

- (i) Shorter corridor.
- (ii) It can be arranged in all systems.

#### DISADVANTAGES

- (i) Light usually from back.
- (ii) Waste of spaces as compared to trapezium.
- (iii) Lav. and stores cannot be provided without shutting out the light or having an indirect connection to eliminate this class, though combination can be had to eliminate this defect.

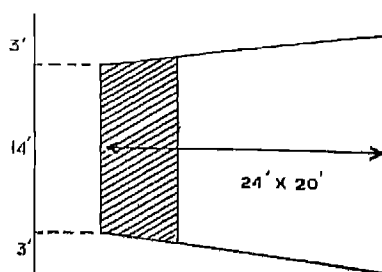
#### TRAPEZIUM CLASSROOM (Wedge shape)

In case of rectangle

$$20 \times 24 = 480 = 25 + 25 + 21 + 21 = 92 \text{ perimeter}$$

In case of wedge shape

$$\frac{14+20}{2} \times 24 = 408 = 25.15 + 25.15 + 21 + 15 = 86.30 \text{ perimeter.}$$



If they are arranged in a perimeter.

$$\text{Saving} = 72 + 5.70 = 77.70 \text{ sq. ft.}$$

$$= (7.22 \text{ sq. m.})$$

Corridor 7 ft. wide

$$= 7 \times 24 = 168$$

$$= 2 \left( \frac{3+4}{2} \times 7 \right) = 49 = 168 - 49 = 119$$

$$\text{Area of the hall} = 119 \times 6 = 714 \text{ sq. ft.}$$

$$(66.35 \text{ sq. m.})$$

$$714 \text{ sq. ft. area} = \text{radius of 15.}$$

Therefore, without having any extra area, extra space is available for corridor and rest of the hall.

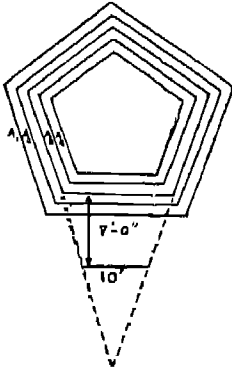
#### ADVANTAGES

- (i) Space saved as compared to rectangle
- (ii) Corridor length reduced.
- (iii) Circulation space within, forming a multipurpose hall with little extra cost.
- (iv) Circulation area = nil—24% as double purpose.
- (v) Economical roof (specially pre-cast) can be formed.

#### DISADVANTAGES

- (i) No definite or proper orientation  
Thus no definite fixed ventilation or light. But this can be solved by proper roof design.

- (ii) Board placed near the corridor and so a bit of disturbance is created which can be solved by back entry.



#### PENTAGONAL CLASSROOM

$$\left. \begin{array}{l} A_1 = 480 \text{ sq. ft.} \\ A_2 = 440 \text{ sq. ft.} \\ A_3 = 401 \text{ sq. ft.} \\ A_4 = 363 \text{ sq. ft.} \\ A_5 = 327.5 \text{ sq. ft.} \end{array} \right\} 10\frac{1}{2}\% \text{ reduction}$$

$$= 84\frac{1}{2} = 420.5 \text{ sq. ft.} \\ (39.1 \text{ sq. m})$$

$$\text{Verandah space} = 98 \text{ sq. ft.} \\ (9.11 \text{ sq. m.})$$

$$\text{Saving} = 60 + 78 = 135 \text{ sq. ft.} \\ (12.8 \text{ sq. m.})$$

$$\text{Perimeter} = 20 \text{ sq. ft. (1.8 sq. m.)}$$

$$\begin{aligned} \text{Saving} &= 158 \text{ sq. ft. per class-} \\ &\quad \text{room for 6 class-} \\ &\quad \text{room} \\ &= 158 \times 6 = 1048 \text{ sq. ft.} \\ &= 97.4 \text{ sq. m} \end{aligned}$$

$$\begin{aligned} \text{Saving of space which can form a hall,} \\ \text{Common wall} &= 16.5 \text{ ft. (5.03 m)} \\ &\quad \text{only but in case of} \\ &\quad \text{rectangle} \end{aligned}$$

$$\text{Common wall is } 20 \text{ ft. (6.10 m)}$$

#### ADVANTAGES

- (i) Lesser area as compared to rectangle.

- (ii) Can be arranged in a circular pattern which can be made to have a multipurpose area within or have a hall with little extra cost.

- (iii) Can be arranged in clusters and in some other forms.

#### DISADVANTAGES

- (i) No definite circulation and hence no definite light ventilation. This can be solved by roof design.
- (ii) Board near the corridor and so a bit of disturbance.

#### HEXAGON

In this case circulation comes to 43.3%.

#### ADVANTAGES

- (i) Many combinations are possible, which can never be had in any other form.
- (ii) It is acoustically suited.
- (iii) Light and ventilation can be fixed in a direction.

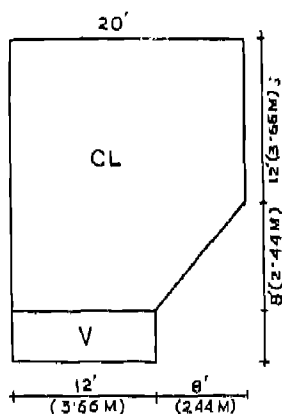
#### DISADVANTAGES

- (i) It cannot be arranged in a circle, if so, the only space left within is equal to the area of the classroom itself.

$$\begin{aligned} \text{Total area of classroom} &= 448 + 45 \\ &\quad \text{(wall area.)} \end{aligned}$$

$$\begin{aligned} \text{Circulation area} &= 84 \text{ sq. ft.} \\ &\quad (22\%) \end{aligned}$$

## ADVANTAGES

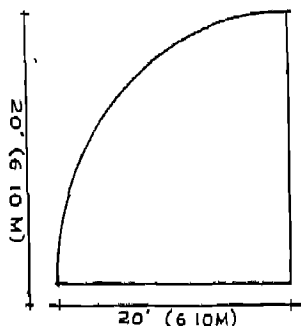


## ADVANTAGES

- (i) Saving of 32 sq. ft. per room reduction in teacher's space which is useless.
- (ii) It gives direction towards the black boards.
- (iii) The furniture can be arranged in any manner.
- (iv) Adequate space for almirah, charts and maps.

Total area of the classroom =  $314 + 53$   
(wall area).

Circulation area = 105 sq. ft. (18%)



- (i) Corridor reduced.
- (ii) Teacher's side extra space reduced.
- (iii) Light throw is very good.

*Economy achieved in terms of finances*

In case of trapezium shape, the saving of the space in terms of perimeter is 77.70 sq. ft. and if the corridor of 7'0" is included the saving is 49 sq. ft. in terms of corridor space. Therefore total saving including circulation area =  $77.70 + 49 = 126.7$  sq. ft.

Total number of schools in 4th five year plan = 347500

Total classrooms (5 classrooms in one school) = 1737500

Total saving area =  $1737500 \times 126.7$   
= 21892500 sq. ft.  
(2025325 3 sq. m.)



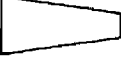


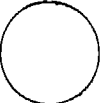
i.e. cost of const Rs. 25.00 per sq. ft.  
(Rs. 269.00/sq. m.)

Total saving in terms of cost of construction = 51.78 crores.

If the cost of const Rs. 20 00 sq ft  
Rs. 43.7850000

If the cost of const. Rs. 15.00 sq. ft.  
Rs. 328387500

Different systems possible for the various forms of the classrooms in terms of economy. The number 1 denotes the highest economy. The number 5 denotes the lowest economy as well as least suitability.

Forms	Linear	Staggered	Cluster	Group	Double loaded	Circular arrangement
	5	5	4	3	1	Nil
	Nil	5	4	4	Nil	Nil
	5	4	2	3	3	1
	5	4	3	3	3	2
	5	6	2	2	3	1
	Nil	Nil	3	2	Nil	1

N. B. : The different combinations and reference to economy and suitability to a particular place are shown in the next pages

Use efficiency in terms of time table adjustments, additional shift and additional uses can be achieved.

#### Time Table Adjustment

Reduction of contract hours	Reduction of No. of classroom	Introduction of outdoor works, play, teaching within time table.
30 hours and teachers load maximum 24 hrs/ week and minimum 6 hrs. for group studies.	3 to 4 for 5 classrooms	Six outdoors.

Economy achieved total 66% space.

#### Additional shifts

Full shift 2 numbers.

Shift (A) 8 A.M to 1 P.M.=5 hrs.

Shift (B) 12 P.M. to 5 P.M.=5 hrs.

12 to 1 class used by outdoor work.

Part shift 2 numbers.

Introduction of outdoor work, play teaching within time table  
full shift=100% economy can be achieved

#### Additional uses by the community

1. Adult education.
2. Club.
3. Panchayat.
4. Ladies club.
5. On hire during summer as dormitory or Barat Ghar

Every accommodation must be designed for multipurpose uses and with greatest economy or revenue return.

Hall—multi-use for different activities that is prayer exhibitions, examination hall, polling booths, barat ghar, public meeting, indoor games, etc.

Multi-use of classroom is for teaching and group discussions, story telling, demonstration, etc. As a dormitory if cupboard could be provided to store night bedding, cloths, etc.

### *Circulation Space*

It is used as a display space for exhibition, niches are formed on the walls of classroom. Extra circulation space increased at the entrance of the school which can be used as a stage for the open assembly.

### *Open spaces*

Multi-purpose uses are play spaces for prayer, for outdoor classes and creates an environment.

### *Furniture*

Multi use of furniture is in open spaces in multipurpose hall and in group discussions. Two tables or two benches can be combined for sleeping in case of such a necessity.

Type and method of construction, traditional or rational, must be with full cognizance of cost dynamics leading to economy.

The type of construction selected for a specific location must rely maximum on the local materials, ease of construction with self-help resulting in economy.

Self-help or sramdan could be done by the local people or teacher and taught,

the broad divisions are as follows :

1. That supervised team-work will result in maximum use of self-help construction leading to economy in labour cost and contractor's profit and overheads.
2. That children above the age-group of 9 years are trained in skilled types of construction in batches, i.e. for wall construction, floor construction, plastering, etc. in accelerated, sectionally oriented short duration training course varying between one to two weeks.
3. That the children below the age-group of 9 years are trained for minor work, i.e. in making concrete aggregates, curing of walls, plaster, flooring, etc.
4. That final touching is to be done by the skilled labour or employed mason.
5. That the economy achieved could be of the order of 40 to 50% of the cost

The school buildings should be very good in various relative needs and subsidiary requirements.

1. Fund raising for augmentation of environmental maintenance :
  - (i) Donation by the people.
  - (ii) By arranging fetes.
  - (iii) Rent from furniture and use of the hall
2. Number of the doors  
Reducing two doors to one in classroom.
3. Light requirements.  
Natural light should enter in the classrooms from the left side  
30 foot candles recommended for



<i>Foundation</i>	<i>Walls</i>	<i>Plastering and pointing</i>	<i>Lintel</i>	<i>Roof</i>	<i>Doors and windows</i>	<i>Flooring</i>	<i>Remarks</i>
Lime Concrete	Mud situ adobe	Waterproof Mud Plaster Cement Plaster	Wood-logs	Tiles AC, GI sheets	Brace and batten	Brick tiles, I.P.S. flooring	Suitable for rural areas (cheaper)
Lime and cement concrete	Brick wall	Cement and lime plaster pointing	R.B. and R.C.C. lintel Brick Arch Precast lintel	R.B. R.C.C. Jack Arch, Precast conc units composite roofs.	Panel flush sliding, panel with glass, precast frame door	IPS, Terrazzo rubber linoleum stone flooring	Suitable for Urban and rural (average to high)
Concrete base (Brick footing)	Jax board fitted in conc. post	Cement plaster	Nil	Jax board on truss	-do-	-do-	-do- (low cost)
-do-	Panel constr.	Plaster if required	Lintel by itself	cored units, channel units, cellular units, doubly curved cells	-do-	-do-	-do- (medium cost)
-do-	Guniting wire mesh, bamboo mesh.	Spray plaster	Nil	-do-	-do-	-do-	suitable for urban areas (low cost)

the light standard for reading and writing in the classroom.

4. Lavatories, if needed, can be provided for both the sexes in a corner of the compound.

### *Conclusion*

It will be seen from foregoing studies that the forms not only enhance the environment, add to the superior functional utilizations, fulfilling varied needs in classroom context for latest teaching methods now, and in future times to come but also lead us to economy in man, material and money for increased provision in services of millions of our people for educating them to read, write and rehotetic.

The study leads to the following attainments :

1. Classroom forms have attained functional suitability and economy.
2. The novel combinations of classrooms has led to the functional and economical grouping with least circulation space.
3. Use efficiency has led to highest

and best use leading to National Economy which has been achieved (a) by shape, size and form of classroom, (b) by time table adjustment and (c) by use of additional shifts adjustment.

4. Every accommodation has been designed for multipurpose uses and with greatest economy and revenue return possibility.
5. Type and method of construction, traditional or rational has been deployed with full cognizance of cost dynamics leading to economy.
6. Type of construction selected for a specific location must rely maximum on the local materials, ease of construction with self-help possibility leading to economy and environment.
7. The use of school buildings has been achieved in various rational needs.

It is thus, Forms, Functions, Feasibility in three 'F', when organized through three 'M', will lead us to fulfil the demand of three 'R'. □

# Dropouts : An Exploratory Study

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SOMETIME ago a study on "Wastage and Stagnation in Primary and Middle Schools in India"<sup>1</sup> was conducted by the present investigator. The data obtained were subjected to discriminant function analysis. It was revealed that six variables which maximally discriminated dropouts from those who stayed in the school for graduation were: the parent's view of the child's educational performance, the child's interest in education, motivation for learning provided at home, the pupil's academic performance, attendance in school, age at the time of admission to the school. It will be seen

that of these six variables four relate to the pupil himself. That is, if we are somehow able to stimulate pupils' desire to learn, the incidence of dropping out can be minimized substantially. This conclusion, even if it were not based on research, seems to be obvious, and perhaps applies no less, and rather more to adolescents than to the children of primary or middle school age-group.

Now since pupils' desire to learn is conditioned to a great extent, albeit not wholly, by their ego-ideals, it was decided to investigate into the following

1. The self-concepts and ego-ideals of dropouts and stay-ins.
2. The interviewing technique that

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<sup>1</sup>R.C. Sharma and C.L. Sapia, *Wastage and Stagnation in Primary and Middle Schools in India*, New Delhi NCERT, 1969, 166.

can be used most profitably with adolescents to accomplish the above purpose.

Incidental to these purposes, a number of hypotheses were advanced. These hypotheses were based, more or less, upon the self-situational theory of personality put forth by Mathewson although Staffire's<sup>2</sup> discussion of the theories of counselling was also examined. The Mathewson's<sup>3</sup> theory implies that it is in one's cultural and social environment that one satisfies one's basic and acquired drives as well as meets frustrations and attendant anxiety arousals. It is in such an environment that one develops one's ego upon which hinges one's entire personality structure which includes the attitudes and interests one has towards education. The structure and functioning of ego may, therefore, provide the probable dimensions on which adolescents—dropouts from schools and stay-ins in them—may differ from one another. It is hypothesised that a dropout has a weak ego, and a stay-in a strong one.

In this context it may probably be stated that a strong ego is indicated in one's ability to maintain one's integrity in dealing with others. A weak ego is indicated by the discrepancy between the self-concept (i.e., actual-self as perceived and conceived) and the ego-ideal (i.e.,

idealized self-image or what one would like to be ideally). This discrepancy cannot be examined by any method other than knowing the self-evaluation and self-reports on idealized self-images of those involved. Hence phenomenological approaches seem to be the only plausible method for conducting such studies.

To study an individual's ego-ideal and self-status in a phenomenological way, it is necessary to study his perceptions of the persons whom he prefers and admires and the activities the latter are perceived as engaging in. If the persons admired by an adolescent are perceived by him as pleasant in their interpersonal relations, as providing affect gratification to him and as engaging in socially approved strivings, he will have an integrated and strong ego as contrasted with another adolescent whose preferred associates and admired persons are perceived by him as giving support to his dependency needs.<sup>4</sup>

A study of the types of persons admired by adolescents therefore became incidental to studying their ego-ideals. In this connection, the following hypotheses were formulated :

- 1 The adolescents who stay in the school are more clear in their ego-ideals than those who drop out.
- 2 The adolescents having clear ego-ideals admire the friends who engage in socially-approved strivings.
- 3 The adolescents staying in schools have more fully developed self-concepts than those who drop out.

<sup>2</sup>Robert Hendry Mathewson, *Guidance Policy and Practice*, New York : Harper and Row, 1962, Chapter 2

<sup>3</sup>W F. Staffire (ed.), *Theories of Counseling : Guidance Counseling and Student Personnel Administration*, New York : McGraw-Hill, 1965. The theoretical orientations counselling practitioners have been perceived by Staffire as falling under four schools of thought : (1) vocational, (2) behaviour theoretical, (3) client-centered, (4) psycho-analytic orientation in counselling.

<sup>4</sup>John H Rohrer and M J Edmonton, *Eighth Generation*, New York : Harper and Bros, 1960. Discusses that despite other factors remaining nearly identical, how differences in ego-ideals lead to different careers.

Apart from having some insight into the adolescents' ego-ideals and self-concepts, a feel for the components of their self-system (motivational, emotional, intellectual, valuational, attitudinal, and implemental)<sup>5</sup> was also considered necessary for understanding them. No hypotheses were formulated in the area of the aspects of the "self-system", since the study was an exploratory one and even the three hypotheses formulated under the area, "integrational ego-functioning" were not delineated with any purpose other than to test whether or not the methods employed in the present study were adequate to provide data for hypothesis testing

### *Procedure*

After discussing various approaches and methods of knowing about the adolescents (for example, observation of the behaviour of adolescents, case study method, and the like), it was decided in agreement with self-concept theorists, that one cannot "understand and predict human behaviour without knowledge of the subject's conscious perception of his environment, and of his self as he sees it in relation to the environment".<sup>6</sup> Needless to say, the self-concept theorists (phenomenologists), and Rogers<sup>7</sup> is one of them, believe that self-concept is not always in awareness but it is always available to awareness and therefore by definition it excludes the unconscious. If what Rogers says is accepted, a phenomenological approach towards understanding adolescents

becomes defensible, and as indicated earlier, is perhaps most appropriate.

Under this rationale the choice of the investigator fell upon "interviewing" as a method of collecting data. The questionnaire for the interview was kept substantially unstructured under the assumption that a fully structured questionnaire imposes the perceptions of the interviewer upon those of the interviewees and is therefore inadequate for understanding human beings in their self-situational relationships. Therefore, instead of adopting a Q-sort or a long list of statements of behaviour descriptions, the following techniques were tried out and compared with each other. (1) critical incident technique, (2) examination of phantasy behaviour, and (3) non-directive approach (with infrequent channel probes), and (4) adaptations of sociometric techniques. The rationale behind using these techniques was to obtain an insight into the one or more of them which yielded maximum response. Further, it was believed that, except the non-directive approach or a loosely structured and directed, the remaining three were inadequate to collect the desired data. It was assumed that the critical incident technique may provide insight into the self-system since it is aimed at analyzing incidents in which the interviewee received at any time in his life the highest approval and disapproval of his chosen friends, his parents, or his teachers.

### *Tools*

The questionnaire used in the study is given in the appendix. Its first two questions are aimed at building rapport with the interviewees. The third to the seventh questions give an insight into

<sup>5</sup>Mathewson, *op. cit.*, p 23.

<sup>6</sup>Ruth C Wylie, *The Self Concept*, Lincoln. University of Nebraska Press, 1961, Chapter 2

<sup>7</sup>Carl C Rogers, *Client-Centered Therapy*, Boston: Houghton Mifflin Co., 1951.

the type of persons the interviewee feels he should like. It is hoped, these questions will unfold the ego-ideal of the interviewee. The eighth to the thirty-eighth questions are aimed at understanding the type of the interviewee's activities, which he feels were rewarded or punished most by his friend, father, mother and teacher/teachers. The questions are based upon the critical incident technique. They are aimed at providing an insight into the behaviour which was reinforced in the interviewee by the rewards and punishments awarded to him on his engagement in different strivings by his friend, father, mother, and the most liked teacher.

### *Sample*

The time at disposal did not permit coverage of a large sample. In fact, such a sample cannot be selected easily because dimensions of the self are so arbitrary and manifold that it is even difficult to guess about the size of the standard errors and standard deviations relative to each dimension needed for deciding upon the size of a sample. The best sample under such circumstances may seem to be a quota sample with sampling fraction varying according to the size of different strata into which the population is divided.

If for the sake of simplification it is assumed that one is willing to study only ego-ideals of adolescents and that one can measure them, it is difficult to decide upon a defensible size of sample because the simplest procedure of random sampling is in itself not very defensible. The sample could be given by

$$n = \frac{\left(\frac{ts}{d}\right)^2}{1 + \frac{1}{N}\left(\frac{tS}{d}\right)^2}$$

$$\text{where } d = t \sqrt{\frac{N-n}{N}} \frac{S}{\sqrt{n}}$$

where the  $d$  is the degree of error one is willing to tolerate in the estimate,  $n$  is the size of the sample of adolescents,  $S$  is the standard deviation of the ego-ideal scores,  $N$  is the size of the population of adolescents. Now  $n$  cannot be given unless one can guess about  $S$ , which it is very difficult to do.<sup>8</sup>

Constrained by the foregoing limitations and the paucity of time, the investigator was convinced that there was no merit in working upon a sample selected in a sophisticated way. He rather accepted the position that few interviewees may provide sufficient material for divergent thinking. This position was supported by the belief that information about adolescents collected by research workers is scanty, and that sufficient information has yet to be collected by them to provide material for formulation of pertinent hypotheses which may later be tested through further research. This purpose of the study seems to be partially accomplished by the present study which was confined to eighty adolescents—twenty dropouts and sixty staying—living in old Delhi.

### *Data and Analysis*

The framework for analysis as mentioned above in passing was provided by Mathewson's categories relating to the integrational ego function and the six main aspects of the self-system. The other aspects of the self-situational relationships, as indicated earlier (although briefly) while stating the problem

<sup>8</sup>For derivation of the formula, see W. G. Cochran, *Sampling Techniques*, New York: John Wiley and Sons, Inc., 1953, Chapters 2 to 4.

were not included in the study. The hereditary predispositions and acquired psychological dispositions were excluded because studying them required deeper analysis involving depth psychology which was a more time-consuming job. The situational aspects (home life, peer relationship, community conditions and societal sanctions, values and demands, and educational and occupational opportunities) were not studied because they formed antecedent variables to the consequent variable—the selves of the adolescents and because the study was not aimed at analyzing or examining the causal relationships between these two types of variables. It was a study confined merely to surveying the different aspects of the self-system and to studying the integrational and functioning aspects of the ego of the adolescents, and how far these are related to the criterion dropping out.

The data collected in response to questions 1 to 7 and 39 to 41 of the questionnaire were of a very descriptive nature. It was thought that these data presented an image of the idealized selves of the interviewees. Each interviewee, when described the person he admired most really projected his idealized self or what he would like to be ideally in the present social set-up. These data were used to examine the ego-ideals of the interviewees and were analysed into the six aspects of the self-system: intellectual, valuational, attitudinal, motivational, emotional and implemental. These data were also used to study the self-concept of the interviewees.

The replies to questions 8 to 38 were also used to supplement the aforesaid data. They were, however, used in particular to examine the differences between the dropouts and stay-ins on the moti-

vation for staying in the school provided by the friend, father, mother and teacher most liked by them. The data were quantified by awarding scores to the activities of the interviewees according to their educational relevance on a three-point scale. The activities considered educationally relevant were given a score of 3, those educationally neutral a score of 2 and those educationally irrelevant a score of 1. It was observed that the stay-ins were punished/rewarded, that is, given recognition or praise, much more than the stay-ins by their parents. The chi-square ( $X^2$ ) test was used to find out the statistical significance of these data. Its value was found to be significant at .01 level of significance.

### *Findings*

A. EGO-IDEALS. On the basis of analysis of the data, it appeared that the adolescents interviewed had clear images of the type of persons they would like to use as their models. If a crude classification is permitted regardless of the overlap in it, the models given by adolescents fall under two categories:

1. The socially and economically successful elites—big business executives, top level government officials, commissioned officers of the Armed Forces, doctors, engineers, etc.
2. The individualist, the non-conformist, the humanist rather than materialist, etc. The models in the first category, to use Riesman's terminology, are other-directed persons.<sup>9</sup> They are persons

<sup>9</sup>David Riesman, *The Lonely Crowd*, New Haven: Yale University Press, 1961, Chapter 1.

who need, aspire, and strive for social recognition and status. It is these who are invariably stay-ins, though not always on the top of their class. The models in the second category are persons who feel free to do what they feel and think is good regardless of the social direction (i.e., social approval or disapproval). These are the persons who although engaged in productive activities of different kinds, do not care for material prosperity. They may choose as professions art and music, which are relatively less paying. They feel that the war in Vietnam or Israel or anywhere is not desirable and should be stopped.

This classification and other data, notwithstanding their crudity, are suggestive of the following hypotheses which need further study and testing :

1. The ego-ideals of adolescents are amenable to classification in types
2. Boys have clearer ego-ideals than girls. (The girls were not sure if they would like to be—or that their model figure was—an ideal housewife, as they conceived her to be, or whether they would prefer to be a professional.)
3. Stay-ins have clearer ego-ideals than dropouts.
4. Adolescents having clear ego-ideals admire friends who engage in socially-approved strivings.

**B. SELF-CONCEPTS.** On the basis of the few interviews conducted, it would perhaps be unfair to evolve a typology.

Nevertheless, it may be mentioned that the possibility of such a typology is worth exploring since during the course of interviews, the adolescents made statements like, "I am the academic type. I prefer to study rather than chat with friends, etc." Some adolescents indicated that, "I am concerned with human relations, I like people. I like to talk to them. I do not like the war. It kills people. I don't like discriminations among people on account of race, colour, etc." Some said, "I am a practical person. I want action and not books." In brief, adolescents had a conception of what they were basically, and this conception, a holistic or gestalt image, was perhaps available soon after the interviewer had put the question, "Describe yourself as a person." Since the number of adolescents interviewed was eighty only, it was not considered safe to generalize about the difference in the self-concept of dropouts and stay-ins. The data however suggest that dropouts are not that clear about their self-concept as a stay-in is.

**C. SELF-SYSTEM** The open-ended questions provided information on most of the aspects of the self system which was analysed as follows

1. Intellectual aspects : Almost all the adolescents described themselves as being above average in intelligence. This description was not tested or validated against an intelligence test. However, the investigator got the impression, on the basis of his own subjective judgment, that the adolescents interviewed were quite intelligent. Maybe others who belong to less privileged homes and lower socio-economic groups may not be so intelligent. If these teenagers



- were compared to those in other parts of the country after being matched for the socio-economic status of their parents, there may not be much difference found in their intellectual ability. This view has not been examined in the study in the light of any verifiable evidence.
2. **Valuational aspects :** An adolescent seems to hold and describe himself as holding faith in the equality, fraternity and liberty of people.
  3. **Attitudinal aspects :** An adolescent seems to have wholesome social attitudes. He is against regional and racial discrimination. The attitudes of most of the stay-ins towards work, as is the impressionistic feeling of the investigator, are more developed than of those of the dropouts. A stay-in has probably a more respectful attitude for competence than for age. No attitude scale was devised and used in the study.
  4. **Motivational aspects :** Critical incident technique was used to find out the activities on which adolescents were rewarded/punished by their parents and teachers. It was surprising that all the stay-ins interviewed reported they were rewarded and recognized when they got good grades in their academic work and were disapproved when they got poor grades. They also reported that their parents were concerned with their studies. The dropouts, by and large, said that their parents were not much concerned with their studies. They did not reward or punish them over engagement or disengagement with educationally relevant activities.
  5. **Emotional aspects :** The adolescents interviewed seem to be well adjusted within themselves. However, some of them—mostly the dropouts—had trouble with their parents. They found them to be aggressively hostile. Whether this is due to what Friedenberg may describe as, "adults' insistence on cultivating sensitivity and pliability to the demands and expectations of other persons"<sup>10</sup> or whether it is due to any other reason, could not be investigated in this study.
  6. **Implemental aspect :** No information on this aspect could be collected.
- D. SELF-STATUS.** The investigator had a feel from the data that the self-concepts of adolescents were not much removed from their ego-ideals. How much removed they actually were could have been worked out by quantifying the data and computing a distance score,  $D$ , which is given by  $\sqrt{(X_i - Y_i)^2}$  where  $X_i$  is the score on the  $i^{th}$  item of the ego-ideal questionnaire, and  $Y_i$  is the self-concept score of the same individual on the  $i^{th}$  item. Despite the open-endedness of the response, there were many items on which adolescents indicated both their ego-ideals and self-concepts. Despite such item and the feasibility of computing the distance index, it was not used because of its limitations discussed by

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<sup>10</sup>E. Z. Friedenberg, *The Vanishing Adolescent*, New York : Dell Publishing Co., 1964, p. 24.

Cronbach.<sup>11</sup>

Toward the second purpose of the study, that is the interviewing technique which in the opinion of the present investigator yields maximum understanding of adolescents, it was felt that the interview situation as existed in the first two questions of the present interview yielded much more information than that obtained through reports on critical incidents. This feeling was warranted by the fact that even if the sequence (order) of the subsets of questions (Appendix) was inverted, that is, questions on critical incidents were asked first and questions like "Describe yourself as a person", were put afterwards, the latter elicited a much more detailed reply. Not only this, the more structured and channeled probe questions (these are not given in the questionnaire in the Appendix) were put to the teenagers, they seemed to be getting defensive and cautious in their replies. Hence, one can reasonably hypothesize that perfectly structured tools like statements in a Q-sort or even semi-structured tools do not result in obtaining that detailed information about adolescents as is obtained through an unstructured tool containing very few open-ended questions.

In the end it may again be asserted that the foregoing findings have very limited reliability and precision. They constitute purely a framework for formulating and testing hypotheses, few of which have been stated while others, although not stated due to paucity of time and space, weave through the entire findings.

<sup>11</sup>Lee J. Cronbach, "Proposals Leading to Analytical Treatment of Social Perception Scores," in R.A. Waginer and Luigi Petrullo (Eds.), *Person, Perception and Interpersonal Behavior*, Stanford: Stanford University Press, 1958, Chapter 23.

## APPENDIX

### QUESTIONNAIRE

#### *Introduction*

I am Ramesh Sharma. I like to know more and more about teenagers. So far I have been able to identify two of their characteristics. First, they feel free to talk about themselves. They have no inhibitions (and this is good). Second, they are honest and truthful in their dealings (this, too, is very good). Today, my purpose is to learn a little more about them.

#### *Rapport-building questions*

1. Will you tell me from your experience whatever you think of teenagers? (Describe the image or images of teenagers held by you).

2. Describe yourself as a person

*Questions designed specially to study teenagers ego-ideal (the model will be the person admired most):*

3. Give the name of two persons you admire most. Reply A and B.

4. Describe A as a person

5. Why do you admire A?

6. Describe B as a person.

7. Why do you admire B?

#### *Questions based on critical incident techniques*

8. Will you recall an event in your life when what you did was liked most by your most chosen friend? (Yes/No)

9. If Yes, describe it.

10. How did you know that your friend felt pleased?

11. Can you recall an incident when what you did irritated your most chosen friend/friends? (Yes/No)

12. If Yes, describe it.

13. How did you know that your friend was irritated?

14. Can you recall a second incident in which your friend got annoyed over your behaviour or action? (Yes/No)

15. If Yes, describe it.

16. Will you recall an event when what you did pleased your father most? (Yes/No)

17. Describe it.

18. How did you know that he was pleased?

19. Will you recall an incident when what you did irritated your father most?

20. Describe it.

21. How did you know that he was irritated ?
22. Will you recall an event in your life when what you did pleased your mother most ? (Yes/No)
23. Describe it.
24. How did you know that she was pleased ?
25. Will you recall an incident in your life when what you did irritated your mother most ? (Yes/No)
26. Describe it.
27. How do you know that she was irritated ?
28. Will you recall an event when what you did pleased your teacher/teachers most ?
29. Describe it
30. How did you know that he/she was pleased ?
31. Will you recall an incident when what you did irritated your teacher/teachers most ?

32. Describe it
33. How do you know that he was irritated ?
34. Will you recall an incident when what you did pleased you most ? (Yes/No)
35. Describe it
36. Will you recall an incident which was most painful to you ? (Yes/No)
37. Describe it.

*Questions based on phantasy/behaviour*

38. Suppose all of a sudden you find a sum of one million rupees, what will you do with it ?
39. Suppose you have an option to marry one of the 100 persons before you, who have, different attractions whom would you choose as your spouse ?
40. Describe anything about you or say whatever you would like to talk to me or discuss with me. ☐

# Educational News

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## Poverty and childhood learning

JEROME S. BRUNER in *Oxford Review of Education* (Vol. 1, No. 1, 1975) examines the question of relationship between poverty and childhood. He is convinced that "Persistent poverty over generations creates a *culture of survival*. Goals are short-range and restricted. The outsider and the outside are suspect. One stays inside and gets what one can. Very early too they learn in-group talk and thinking and just as their language use reflects less long-range goal analysis, it also tends toward a parochialism that makes it increasingly difficult to move or work outside the poverty neighbourhood and the group. Make no mistake about it: it is a rich culture, intensely personalized and full of immediate rather than remote concerns. The issue is certainly not cultural deprivation, to be handled, like avitaminosis with a massive dose of compensatory enrichment.

"Rather the issue is to make it possible for the poor to gain a sense of their own power—through jobs, through community activation, through creating a sense of project in the future. Jobs, com-

munity action under community control, a decent revision of pre-school and early school opportunities—all of these are crucial. But just as crucial is a sense of the change in the times—the insistence of the powerless that their plight is not a visitation or fate, but a remediable condition. If we cannot produce that kind of change, then our system will doubtless collapse, probably to be replaced by something premised far more on coercion for all rather than just for some. That is why the generation to be raised is so crucial a resource".

## Grade retention may be harmful

A survey made by the Office of the Civil Rights in the Department of Health, Education and Welfare (USA) reveals that 10,07,539 elementary and secondary school pupils were retained in grade for the 1971-72 school year. The direct annual cost of grade retention for the nation as a whole probably was between 739 to 903 million dollars. In an article titled "The Research Evidence on the

Effects of Grade Retention, printed in American Educational Research Association's *Review of Educational Research*, Fall 1975, Vol. 45, No 4, pp. 613-635, Prof Gregg B Jackson observes that "neither the few soundly designed studies nor the major portion of the inadequately designed studies suggest that grade retention is more beneficial for pupils having difficulties in school than in promotion to the subsequent grade". The researcher quotes two studies to believe that educators who favour the use of grade retention usually claim that it serves two major purposes : to remedy inadequate academic progress and to aid in the development of the students who are judged to be emotionally immature. Schools most frequently require a student to repeat a grade when the student has not gained the level of knowledge and skills expected upon the completion of that grade. The rationale is that the students, who have not adequately mastered the material at the grade level they have just completed will not be equipped to profit from the material at the next higher grade level and, for their own good, should not be promoted (Goodlad & Anderson, 1963). Students sometimes are retained in grade because the school personnel judge that they are emotionally or socially immature for their age. These students are seen as unable to adequately relate to their peers or to deal with the responsibilities assigned to students at a particular grade level. It is presumed that such students will be in a better position to develop if they are held back a year and placed in a class where responsibilities coincide more closely with their level of maturity (Scott & Ames, 1969).

However, "it is not at all clear, from good common sense whether either of these justifications accurately reflects what

happens to a child when he or she is retained in a grade. There is little doubt that a pupil who is having serious academic difficulties in one grade is likely to continue having difficulties if merely promoted to the next grade. *What is not clear is how the mere repetition of a grade of schooling is likely to reduce these difficulties. Very seldom is there any substantial special help provided to repeating pupils* ; instead, they are recycled through a programme that was inappropriate for them the first time and that may be usually inappropriate and of less interest to them the second time". In the case of retention for purposes of personal or social adjustment, it is not at all clear that the alleged benefits generally outweigh the possible harm caused by the stigma of having "flunked" a grade and the disruption of the child's friendships caused by separation from her or his former class mates.

## Non-formal education

NON-FORMAL education is an effective way of learning for all categories of young and adult learners. It should be viewed as a functional programme organized in the spoken language, enabling an individual to realize his potential and to be prepared for an active role in solving problems he faces in his profession and environment. In the tribal areas, where two different socio-economic systems of unequal strength meet, non-formal education has to prepare the community to understand the new system, help it during the transition and enable it to become a part of the national life as an equal partner.

Non-formal education emphasizes learning rather than teaching, an emerging rather than a prescribed curriculum, and an elastic and dynamic programme which provides adequate learning opportunities to all individuals throughout their lives. If properly developed, non-formal education will be a powerful influence to bring about a social transformation. This will create that unique blend of formal and non-formal education which is the prerequisite for a learning society and for providing life-long education for all.

The concept of non-formal education and its significance have not yet been seriously taken up by our Education Departments, the teaching community, and the official and non-official agencies which can play a useful role therein on Non-formal Education, Central Advisory Board of Education. The Committee therefore, calls upon the Central and State Governments, in cooperation and collaboration with universities, voluntary organizations and others, to organize seminars, workshops, and conferences to publish authentic books, and to take other necessary measures for the promotion of the correct comprehension of non-formal education as an essential and integrated component of the Indian education system.

### *Priorities*

The areas of priority in non-formal education should be identified in relation to the conditions and needs in different regions and for different groups of learners. However, the following should be the areas of national concern and should have priority for the whole country.

(i) Programmes which cater to the needs of the economically, socially and educationally deprived sections of society and, within this group, to those who are directly involved in or benefiting from the 20-point economic programme.

(ii) Programmes which provide educational support to family planning efforts

(iii) Programmes for children, youth and women to meet their minimum learning needs and those for youth paying special attention to employment preparation.

(iv) Programmes for agriculturists and industrial workers so that the country's economic progress is accelerated.

### *Implementation*

Non-formal education should be viewed as a national programme and during the remaining part of the Fifth Plan, some programme should be extended to every district in every State.

Keeping in view the areas of national concern and their special needs, each State should prepare a State survey of and a plan for non-formal education, followed by district or local surveys to identify the possibilities for appropriate programmes. The Central Government should continue to support programmes organized by state governments and voluntary agencies.

The implementation of the programmes can be effective only if adequate arrangements are made for training the personnel.

In organizing programmes for non-formal education, the educational institutions of various categories as well as the institutions outside the education

system have definite roles to play. The universities and colleges should open themselves to new categories of learners and to the community at large. Schools, industries, public libraries and a wide variety of other institutional facilities should become available for implementing this programme

### Education of weaker sections of the community

IN the programme of universalizing elementary education for children in the age-group 6-14, the highest emphasis recommends the CABE, has to be laid on the education of girls, children of the scheduled castes and scheduled tribes and other weaker sections like landless labourers or dwellers of urban slums. These children form more than three-fourths of the total non-attending children at present.

For universalizing Elementary Education among girls, emphasis should be laid on parental education to overcome traditional prejudices. The appointment of women teachers should be encouraged. As girls are more often required to take care of young children, it would be an advantage to organize creches or nursery classes as adjuncts to schools. These may be conducted by the girls themselves to reduce costs. Free books, and even clothes, should be given to needy girls. Although there should be no hesitation to start separate elementary schools for girls. Where necessary, the general policy should be in favour of co-education.

The problem of universalizing elementary education among the scheduled castes and scheduled tribes is more

difficult. It must also be remembered that these social groups are not homogeneous. Among certain scheduled castes and some scheduled tribes, education has spread widely, while there are some scheduled castes and several scheduled tribes where the rates of enrolment are low and the percentage of literacy is less than even five. It is, therefore, necessary to develop differentiated programmes for the more underprivileged and less advanced scheduled castes and scheduled tribes.

In the case of tribal areas, educational infra-structure is non-existent in many cases. A network of educational institutions of single teacher schools, sub-schools, peripetatic schools and residential schools should be planned for each micro-unit. A supporting network of hostel facilities according to the sparseness of population and the density of the school network should be established. It is also necessary to evolve suitable curricula, adopt appropriate school timing in the context of the local economic cycle, prepare reading material in local dialects, recruit teachers from the local community even with lower qualifications (but greater training input), support non-formal education, provide scholarships and stipends and construct school buildings and quarters for teacher. All these programmes should be built into the tribal sub-plan for education in each State

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### FROM THE FIELD UNITS

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#### BIHAR

*Universities in Bihar Constitute Inter-University Board*

AN Inter University Board for seven uni-

versities located in Bihar has now been constituted. The 14-member Board replaces the University Coordination Committee constituted earlier.

Headed by the Chief Minister, the Board will have the Education Minister of the State as Vice-Chairman, and an eminent physicist, Prof. S.P. Sinha, as a Deputy Chairman who will be the Executive Head of this autonomous body.

Besides the Chairman, Vice-Chairman and Deputy Chairman, the Board comprises the following :

1. Two experts to be nominated by the University Grants Commission
2. An expert from the State Government.
3. All the seven Vice-Chancellors of the Universities of Bihar
4. Director of Higher Education, Ex-officio member.

Major objective before the Board are to tone up the standard of teaching, research work in the universities and to bring reform in the examination system.

#### MAHARASHTRA

*Bombay University to Introduce B. Ed. (Correspondence) and M. Phil. Course*

The Academic Council of the Bombay University decided to introduce the Bachelor of Education (B.Ed.) degree by correspondence and the Master of Philosophy (M.Phil.) degree course. The B. Ed. degree by correspondence will be open to graduates of any university who are teachers in (i) colleges affiliated to the Bombay University or to any university of the State or (ii) junior colleges or higher secondary schools in the State or (iii) secondary schools or higher secondary schools in Goa, Daman & Diu.

Candidates must be on the pay-rolls of the respective institutions and must be sponsored by them. The duration of the correspondence course will be three academic terms.

The M. Phil. degree course will be open to those who have passed the Master's degree examination of Bombay University in the respective faculty or an examination recognized as equivalent thereto, at least in Class II.

It will be a full-time course of two academic terms. There will also be a part-time course extending over three academic terms. The university hopes to be able to start the correspondence courses in October 1976. The school and college teachers working in Goa would also be eligible for admission to these courses.

#### *Surplus College Teachers in Maharashtra*

The Maharashtra Government has asked all colleges in the State to furnish particulars regarding the number of teachers likely to be surplus in each faculty as a result of the introduction of 10+2 pattern. On the basis of information received, a pool of surplus teachers may be formed. Government will select lecturers from this pool and post them to different institutions in the state. These teachers are to be given preference over temporary lecturers. The state government is anxious to avoid retrenchment and *status quo ante* shall be maintained in respect of teachers who have been in continuous service since 7 February, 1975. In a resolution issued to colleges, the Education Department has permitted them to terminate the services of those teachers who were appointed after 8 February, 1975, if they could not be allotted work in the junior colleges or degree colleges. The re-organization



of the teaching staff at the collegiate level has become necessary as a result of the introduction of the new pattern of education. The college teachers declared surplus will have the opinion to teach junior college classes attached to their colleges on the clear understanding that if they are appointed to teach junior college classes, they will not be entitled to the revised U.G.C. scales. Their existing pay will, however, be protected. A B.Ed. degree or a diploma in teaching would be an essential qualification for those teaching in the junior college.

#### *Change of Subject at Plus Two*

Change of stream from science to arts or commerce, or from arts to commerce or vice versa has been permitted for students seeking admission to the Second Year Junior College (Std XII), according to a press note issued by the S.S.C. Board. The decision is the outcome of a large number of complaints about non-availability of facilities for certain subjects in second year junior colleges attached to some degree colleges. The Board has, however, made it quite clear that no student who has passed first year junior college (Std XI) with arts or commerce subjects will be permitted to change over to science. Change of compulsory subjects, e.g. language, will not, however, be permitted.

#### *The Popularity of Coaching Classes*

A sample survey conducted in Maharashtra has revealed that nearly 42 per cent of pre-degree students (now Std XII) joined coaching classes during the year 1975-76. More students from commerce faculty (54 per cent) joined these classes. They were followed by 43 per cent science

and 11 per cent arts students. Among science students, 90 per cent joined for coaching in mathematics and 25 per cent for physics. Among commerce students, Business Mathematics claimed 50 per cent. In arts, most students appear to join mainly for coaching in English. The tuition fees paid by an individual student for coaching ranged between Rs. 30 and Rs. 600 per year.

### GOA

#### *Goa Clears Backlog of Untrained Teachers*

ACCORDING to official sources the backlog of untrained school teachers in Goa has already been cleared and the Government has now decided to discontinue the system of deputing school teachers on full pay for the B.Ed. training programme.

#### *Measures to Help Weaker Sections of the Society*

The Government of Goa has announced its decision to embark on educational schemes intended to benefit rural and economically backward sections. A sum of Rs. 4.5 lakhs has been allotted to open high schools in rural areas and set up book banks for poor students. It is also proposed to expand the present scheme of scholarship and stipends to girls of weaker sections.

### ALLAHABAD

#### *Revised Pay Packets to School Teachers*

The Uttar Pradesh Government has revised the pay scale of junior high school teachers from 1 July 1974. About 16,700 teachers of 1,600 aided junior high schools will be benefitted by it. The headmasters will receive monthly pay packet of

Rs. 240 instead of Rs 138, C.T Grade teacher a pay scale of Rs 210 to Rs. 230 in place of Rs. 102 to Rs. 250 and an untrained teacher will get Rs. 180 in place of Rs. 72.

### *Inservice Training of Secondary Teachers*

The admission to L.T. course for inservice teachers (a new scheme) is over.

This training scheme has been chalked out for teachers of Government and aided schools who will be exposed to a training programme of 14 months. They will be put for six weeks in the beginning and 10 weeks at the end of the training programme in selected teacher education institutions of the state. The course began from 1 June 1976. □

# Book Reviews

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## *Rajasthan Men Shikshanusandhan*

Khanna, Indrajit and Verma, Pannalal (Eds.),  
Department of Education, Rajasthan, 1976,  
pp 188, price not mentioned

EDUCATIONAL RESEARCH in India began when the Bombay University first decided to accept a thesis in complete fulfilment of the requirements for its master's degree in education. In Rajasthan, it started when the Rajasthan University first introduced dissertation as a part of the requirements for its M Ed. degree. Everafter the M.Ed. dissertations and Ph D. theses have continued to form the bulk of educational research in a state as well as the country as a whole. No wonder, therefore, that a review of research in education at state or national level will essentially be a review of research leading to master's degree and doctorate at the universities in the state or country. The volume under review is precisely about this.

*Rajasthan Men Shikshanusandhan* is significant in a number of ways. First, the fact that the book was planned, executed, and published by the Department of Education of a state is itself a significant event. In this task, the Department has been able to get the necessary co-operation from a number of researchers

in education from Rajasthan, who worked without any remuneration. The interest and initiative taken by the perceptive state leadership in education in taking stock of educational research conducted in the state so far are certainly noteworthy.

Second, the volume indicates that the state leadership in education has not only become aware of its role, potential, and the resources available in the state but also knows how to put these into a new channel to accomplish a concrete result. The job is thoroughly done. Lest the success of this venture leads the Department to complacency, it should be immediately added that what has been done is only a first step in a series of periodical reviews of educational researches.

Again, Rajasthan is, perhaps, the first state to have systematically catalogued and reviewed educational investigations made within its own jurisdiction. This has been achieved without proper (elaborate) institutional set-up which is only a necessary but not sufficient condition even for co-ordination of research within a particular region. Clearly, then, there is no substitute for effective leadership in any field including that of educational research.

The present book does not list even a

single piece of research ever done by any one of the teacher-educators from the teacher-training colleges in Rajasthan. This omission is puzzling and may either be due to oversight, or it may represent the reality. If it is the former, the omission should be corrected in the second edition. If, however, it is the latter, it is rather a sad commentary on the state of affairs. What has hitherto been passing on as a joke in academic circles, ("The only research works that have ever been done by our 'professors' were those for their Ph.Ds.") now appears to have been true all the time. One wonders if the teacher-educators are entertaining (or rather suffering from) a belief that research is to be done by the students only and that, too, for degrees as they had done it. If the above is true, then, the teacher-educators probably seem to have learnt to perceive research as a mode of study to be adopted by students in lieu of papers, examinations, etc. rather than as a mode of inquiry for generating new knowledge in which they have a major role to play. Until this awareness is created among the teacher-educators, they will continue to be functioning, as licensee importers and sole area-distributors of knowledge. It is time our teacher-educators took up the challenge of generating and producing new knowledge to meet the internal demand of expansion and improvement of education and, then, hopefully to meet the external demand.

The book enumerates over 721 studies in education. About 97 per cent of these have been done by the students in Rajasthan for university degrees. The rest are from different state agencies in education. The studies have been classified into twelve relatively independent areas. The areas along with the percentage figures (in parenthesis) include : 1. Philosophy

and Sociology of education (6.4), 2. Curriculum and Textbooks (8.0), 3. Personality (11.9), 4. Teaching-Learning Process (7.3), 5. Educational Guidance (15.0), 6. Vocational Guidance (5.8), 7. Correlates of Educational Achievement (8.7), 8. Measurement and Evaluation (8.7), 9. Teacher Education (13.0), 10. School Organisation (10.7), 11. Educational Administration (3.9), and 12. Social Education (0.6).

Each of the twelve sections is jointly dealt with by two authors who, along with their advisors and critics, have performed their tasks with seriousness of purpose. As a result, the quality of the reviews is satisfactory. The potential of Hindi as a language for critical appreciation has been successfully exploited. The reviewers are adept in the use of language, expressing their ideas precisely and pleasantly.

The purpose of this book was not merely to present a compilation of findings, Sri Indrajit Khanna says in his foreword, nor to supply a rearranged annotated bibliography. The book was instead designed to be a point of departure for future investigators. The book has not only lit the path already traversed, but it has also indicated the hitherto unexplored areas and has justified its subtitle, *Achievements and Possibilities*. In the opinion of the present reviewer, the book has achieved its objective admirably well.

A few suggestions are offered here to enhance the reference value of the next edition or its future successors, if any.

1. A common bibliography at the end of the book would have been convenient for the readers who could find out references easily. This could avoid multiple entries for different chapters.

2. Author index and subject index

are a must for any reference book such as the present one

3. Coverage, in terms of entries, is comprehensive so far as education departments and faculties of the universities are concerned. But the entries for reviews need not be limited to master's and doctoral works in education only. Instead, similar works from other disciplines (like, philosophy, sociology, psychology, law, economics, anthropology, political science, social work, etc.) having a bearing on education should find a proper place in a review like the present one.

4. Free flow of information regarding educational researches should be ensured. Assuming that the present book is the first in a series of periodical reviews of educational researches in Rajasthan, the subsequent numbers in the series may be brought out regularly. To facilitate this and also to meet the interim needs of information, lists of researches and their abstracts may be brought out quarterly in the form of a periodical.

PRAFULLA M. PATEL

### *Freedom to Die*

O. Ruth Russell, Human Sciences Press,  
New York, 1975

THIS book is a valuable addition to the literature available on *euthanasia* which is still a controversial issue in countries like the U.K., United States, Canada. And the author has made it a useful material for further research and thinking.

The writer has very clearly defined different aspects and types of *euthanasia*, which is derived from the Greek word "*thanatos*" meaning death, and the prefix *eu* meaning easy or good. It means

"granting painless death to a hopelessly ill patient with a non-curable disease."

The book is divided into three parts. The first part "Changing Attitudes toward Death and Dying" deals with the theoretical aspects of *euthanasia*. A table provides information about different types of *euthanasia* which have been the subject of debate for a long time. And there is an interesting discussion on the different attitudes which different individuals have shown towards legalization of *euthanasia*. The writer believes that with the changing attitudes towards an easy and desirable death there is a growing need for further studies in this field.

As the title suggests, the second part of the book "Historical Review to Thought and Action on Euthanasia" consists of information regarding the very many attempts made towards its legalization. Different attempts and the case studies have been very clearly given in this part. The whole section is further divided into five chapters. These chapters are about the attempts made during different periods. There are a number of references made to other books on the subject. *The Right to Life* by St. John Steves, *Death of a Man* by Mrs. Lael Wertenbaker, etc. and works of different medical associations.

Most of the opposition to *euthanasia* has come from the church and physicians. But at the same time this is also true that doctors and nurses feel the need for the legalization of *euthanasia* bill which has been presented in the parliaments of different countries from time to time. Some have very strongly and openly supported it but the result is that because of the strong opposition no bill has yet been accepted.

The third part of the book "Legalisation of Euthanasia: Arguments and Pro-

posals" is the most important part of the book because in this section different questions and doubts of the opposition, pertaining to different possible aspects, have been answered in a very logical and satisfactory way.

Though no country as yet has legalized *euthanasia*, in recent years some non-English speaking countries, viz. Belgium, France, Germany, Holland and Italy have acknowledged its importance. The

writer has strongly advocated the legalization of a carefully prepared euthanasia bill. Well-written and intriguing case studies are capable of sustaining the interest of the reader. A select bibliography and references may be useful for the readers to do further thinking and conduct studies on similar lines in their respective countries.

NLERJA SHUKLA

# Select Bibliography

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## BOOKS

- ADAVAL, S B. (Ed.), *Educational Research* (Third Indian Year Book), New Delhi, NCERT, 1968
- BUCH, M B., *A Survey of Research in Education*, Baroda, CASE, 1974 pp. 616, Rs 120
- COREY STEPHEN M, *Action Research to Improve School Practices*, New York, Columbia University, 1953, pp 161
- AND SHUKLA, J K, *Practical Classroom Research by Teachers*, New Delhi, NCERT, 1962, pp. 116
- EBEL, L ROBERT (Ed ), *Encyclopedia of Educational Research* (4th edn.), The Macmillan Co., Collier-Macmillan Limited, London, 1969, pp 1522
- GAGE, N.L, *Handbook of Research on Teaching*, Chicago, Rand Mc-Nally & Co, 1963, pp 1218
- GATES, ARTHUR I., *What Research Says to the Teacher* (33 Vols.), Washington, N.E.A., 1962
- GLASSER, ROBERT (Ed ), *Training Research and Education*, University of Pittsburgh Press, 1962, pp 596
- SMITH, B. OTTIANEL, *Research in Teacher Education*, New Jersey, Prentice Hall, 1971, pp 166
- SMITH, EDWARD W, KROUSE, W STANLEY AND ATKINSON, M. MARK, *The Educators' Encyclopedia*, Prentice Hall, Inc, Englewood Cliffs, NJ, 1961, pp. 914

## JOURNALS

- Alberta Journal of Educational Research* (Q), University of Alberta, Edmonton, Alberta, Canada TS G2 E1
- American Educational Research Journal* (Q), American Educational Research Association, 1126, 16th Street, N.W. Washington DC 20036
- Australian Journal of Education* (3/Year), Australian Council for Educational Research, Fredrick Street, Hawthorn, Victoria-3122
- British Journal of Educational Studies* (3/Year), Bassel Blackwell Publisher, 108 Cowley Road, Oxford
- California Journal of Educational Research* (5/Year), California Teachers' Association, 1705, Murchison Drive Burlingame, California 94010
- Current Literature in Education* (B/M) Library and Documentation Unit, NCERT, New Delhi (Mimeo)
- Education Abstract* (Q), Library and Documentation Unit, NCERT, New Delhi (Mimeo)
- Education Index* (10/Year), The H.W. Wilson Company, 950, University Avenue, Bronx, NY, 10452
- Educational Research* (3/Year), National Foundation for Educational Research Publishing Company Ltd., Journals Deptt., 2 Jenning Bldg., Thames Avenue, Windsor Burks., SL 41QS
- Harvard Educational Review* (Q), Longfellow Hall, 13 Appianway, Cambridge, Massachusetts-02138
- Indian Education Abstracts* (Q), Deputy Controller, Deptt. of Publication, Govt. of India, Civil Lines, Delhi-110006
- Indian Educational Review* (Q), National Council of Educational Research and Training, New Delhi
- Indian Historical Review* (Q), Indian Council of Historical Research, 35 Feroze Shah Road, New Delhi
- Indian Studies—Past & Present* (Irregular), Today & Tomorrow Printers & Publishers, 24-B/5 W.E.A. Karolbagh, New Delhi
- International Review of Education* (Q), Martinus Nijhoff, Lange, Voorhout, P.O. Box 2691, Hague, Netherlands
- Journal of Education and Psychology* (B/M), Sardar Patel University, Vallabh Vidya Nagar, Gujarat
- Journal of Educational Research* (M), Heldref Publication, Room 302, 4000 Albemarle Street, N.W. Washington DC 20016.
- Journal of Research & Development in Education* (Q), University of Georgia Rooms G-3, Aderhold Building—Athens, Georgia-30602.
- Oxford Review of Education* (3/Year) Carfax Pub. Co., Oxford, England
- Review of Educational Research* (5/Year) American Educational Research Association, 1126, Sixteenth Street, N.W. Washington D.C. 20436





# JOURNAL OF INDIAN EDUCATION

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## CONTENTS

### EDITORIAL

UTPAL MALLIK	1	Curriculum and Research in Biology : Views of an Unknown Biologist
BANKU B. GANGULY	8	From Biology to Life Science : Impact of this change on Biology Education
ARUN K. MISHRA DAVINDER KAUR ARORA	25	Simplified Protoplast Isolation Techni- ques : For Secondary School Biology Courses
V M MEHER-HOMJI	30	Role of Anthropogenic Factors on the Vegetation of India
ASHA JOGLEKAR	47	The Use of Fish in the Teaching of Bio- logy at the School Level . A Preliminary Survey
ASOK K GHOSH	54	Implication and Role of Cultural Behavi- our in Life Science
M.V. RAMJI	63	Some Interesting Tests in Life Science for Secondary Schools
	70	EDUCATIONAL NEWS
	79	ANNOTATED BIBLIOGRAPHY

## THINKING OUT RIDDLES

BIRDS reared in sound-proof rooms sing tunes appropriate to their species. The tunes must be genetically represented, presumably in the chromosomes. By means of a study of 'mutant tunes' it might be possible to recover the structure of the genetic determination. If, for example, the notes were represented linearly along the length of a chromosome, one would expect an occasional bird to sing tunes backwards. Since this does not happen, it would appear that the organisation is somewhat hierarchical.

—'Genetical Music', Anon, *The Scientist Speculates, An Anthology of Partly-Baked Ideas*, Heinemann, London

A GOOD deal of work in the theory of evolution is concerned with questions of the form 'This species has a certain attribute: what are its advantages?' I think it may be stimulating to ask quite often, 'This species does not have a certain attribute: what are its disadvantages?', the obverse of Natural Selection: Natural Rejection.

For example, consider the blindness of cave-dwelling newts. Presumably good vision depends on a large number of favourable genes, so that in the absence of positive or negative selection, the eyes would gradually atrophy.

But now take the example of vitamin B<sub>1</sub>. Unlike the red mould, we do not have the enzymes for synthesising this vitamin (nor for any other—that is why they are called vitamins). Beck speculates that our ancestors may once have been able to synthesise vitamin B<sub>1</sub>. But why did animals which could not synthesise it win the evolutionary struggles against those that could? One would have thought that there must be at least a slight advantage in being able to synthesise it. It makes one conjecture that *the enzymes required for the synthesis may be in some unknown way disadvantageous*.

—'Natural Rejection', I.J. Good, *The Scientist Speculates, An Anthology of Partly-Baked Ideas*, Heinemann, London

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# Editorial

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## THE SCIENCE OF LIFE

IN THIS issue we have used an article that traces the evolution of 'life science' (which is as experimental as physics or chemistry) from the biology of the past (which was mostly descriptive). The point the said article has made clearly explains why we have brought out this issue on the teaching of life science at the school level.

Since a course in life science has now become a necessary component of the school syllabi, this issue discusses the importance and significance of life science in the prevailing pattern of science education. This, however, logically ushers in discussions as to 'how much' to teach, keeping in view the university education, and 'how' to teach—all this we have included.

But in this column, our main concern will be to discuss the 'composite' nature of this newly evolved science. Because an informed awareness of the relatedness of the sciences on the part of the teachers is a precondition for science teaching. In this context, we are tempted to wonder whether something like 'social history of the sciences' could possibly be accommodated in the growing and changing syllabi for teacher education. Till then, this awareness, if personally cultivated by our teachers, will be of great help in fostering a scientific attitude among the students.

We shall start with some of the earliest of questions and speculations regarding creation. And we shall bear this in mind that they were not only about the origin of the inert physical nature, they also significantly included—

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\*We thank Prof. B. Ganguly, Department of Education in Science and Mathematics, NCERT, for helping us in preparing this issue of *JIE* — EDITOR

though in a seminal form—the questions regarding the origin of life. Let us consider the creation hymn in the *Rigveda*, x. 129.

“What was there at the beginning ?”

“What covered all ? what sheltered ? what concealed ?” Then come the mystical speculations :

“There was neither death nor immortality, neither heaven nor earth, neither day nor night. Possibly there was water’s fathomless abyss, and the germ, that lay covered in the husk, burst forth, and from this spark burst forth all creations. There was only one who breathed breathless by itself, from whom all this creation came, and the gods themselves came later into being.”

Faint traces of observation made in the remote past can be detected here, particularly the awareness of the life-breeding and life-preserving capacities of water, which forms a part of the speculation about the ‘maker’. As such they were not scientific queries, but they contained the beginning of the close observation of the flora and fauna during the centuries that followed the *Rigveda*. The effective use of herbs in the ancient Indian system of medicine and art and science of surgery testify to centuries-long observation, classification and experiment. The knowledge of biology is inextricably mixed up with the knowledge of botany, zoology, chemistry and physiology. But the real trouble started with our biological past. In India, it was decided on a vast time-scale with the omnipresent-omniscient ‘maker’ at the end of it.

In the West, the Book of Genesis in the *Old Testament* became a prey to Euhemerism.\* Even Sir Isaac Newton in his historical writings\*\* treated it as ‘historical’ and came out with intriguing conclusions.

The theory of Special Creation that all animals were created in their present and final forms, was considered ‘scientific’ in the light of the *Old Testament* the historicity of which was never questioned. This was particularly true in the seventeenth century. We may indeed say, in the beginning of biology there was chaos.

Adam lived for nine hundred and thirty years, and his seventh descendent Methuselah lived for nine hundred and eighty-two years, and only when his grandson Noah was six hundred years old, came the Great Flood ! So the biological past of this planet, or the origin of the planet for that matter, was an exercise in simple arithmetic.

James Ussher, Archbishop of Armagh, conclusively stated in his *Annals of the Ancient and New Testaments* (1650) that the earth had been created in 4004 B.C. And what Ussher did not say, the Vice-Chancellor of the University of Cambridge, Dr. John Lightfoot, had said specifically way back in 1642.

.....heaven and earth, centre and circumference, were created all together in the same instant and clouds full of water...this took place and

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\*Euhemerism is a belief that all the mythological characters were in reality historical—deified and sanctified later. The word is derived from Euhemerus, a Greek mythographer of the fourth century B.C.

\*\*Sir Isaac Newton, *The Chronology of Ancient Kingdoms Amended* (London, 1728)

man was created by the Trinity on October 23, 4004 B.C. at nine o'clock in the morning.

—*A Few and New Observations on the Book of Genesis,  
the most of them certain, the rest probable, all harmless,  
strange and rarely heard of before, 1642*

And Lightfoot called them 'harmless' !

These comfortable dates literally paralysed biological enquiries for more than a century, and that despite the findings and observations of Jean Baptiste Lamarck who lived and worked during the French Revolution in the last part of the eighteenth century. And since the science of archaeology and geology were passing through an embryonic stage, it was impossible to question the comfortable dates or the theory of special creation

The specimen collectors and fossil hunters were sneered at by the powerful pens of the day .

Philosophers more grave than wise  
Hunt science down in Butterflies,  
Or fondly poring on a Spider,  
Stretch human contemplation wider,  
Fossils give joy to Galen's soul,  
He digs for knowledge, like a Mole, ..

In such a milieu, the Swedish naturalist Carolus Linnaeus was classifying the flora and fauna by families and species. And "the geologists and the fossil hunters had been tapping away for a hundred years before they pieced together the single story of the earth's crust... Fifty years later the careful botanical and animal observations fell into place.. suddenly....The likenesses were no longer merely a method of classification, they were suddenly seen as the living foot-prints of their historic causes " (*The Common Sense of Science*, J. Bronowski). And their history was long—much much longer than what Lightfoot wanted us to believe.

At this point it is interesting to note that the third volume of Sir Charles Lyell's *Principles of Geology*, published in 1833, gave a solid material base to Charles Darwin's theory of evolution. (His *The Origin of Species* made the year 1859 the most important nodal point in the history of scientific thought)

From then on, the science of biology came onto a different plane—the watershed of man's scientific enquiries—on the one side of which were the mystical or scripture-centred speculations, on the other side were the increasing knowledge of geology, archaeology, palaeontology, chemistry, physics and medicine, enriching and enlightening biology and each other

The twentieth century probed into the microcosm and macrocosm lighted up phenomena like the 'physics or chemistry of life'. The study of life forms

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—*Four Letters from Sir Isaac Newton to Dr. Bentley Containing Some Arguments in Proof of a Deity* (London, 1756)

in the context of their ecologies and the physical and chemical processes in the smallest unit of the living bodies have opened up possibilities for genetic engineering. The development of the science has been both vertical and horizontal, reaching a stage where a strictly ethical evaluation of the queries, researches and their uses has to be made, because on them depends the survival of the species.

And this is the stage when life science comes of age, studying and controlling our environment, making each of us morally responsible for the survival of the species, and reforming the familiar and worn-out concepts like 'citizen,' 'city,' 'scientist' and 'society' in a new light. The replacement of the word 'biology' with 'life science' is not a fad, and contrary to some thinkers, life science is not a man-centred or man-oriented study. It studies the phenomenon of life as a whole, recognizing the *Homo sapiens* as a part of it. Life science bases itself on the broadest range of disciplines. It has taken over our moral being also. □

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# Curriculum and Research in Biology

## Views of an Unknown Biologist

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I WAS a six-year-old boy when the Mudaliar Commission Report had recommended a total reorganization of the Secondary Education. This, however, is nowhere near suggesting that my boyhood had much to do with the recommendations of the Report. What I mean is that more than two long decades have passed since the Report was first published. These two decades have witnessed a stupendous growth of factual knowledge in all the branches of science and the doubling period of scientific advancement has come down to less than ten years. But our textbooks and methods of teaching in the classroom have not been able to keep up with the pace

The very basis of our school biology has remained unchanged ever since the subject was first introduced.<sup>1</sup> The structures, definitions and an unending series of technical terms seldom permitted biology to become an inquiry into life. The attempts made in the sixties, however, were noteworthy for their effort towards an upgraded school biology and also for the 'not-too-modern' curriculum which they had prepared.

Presently, there is going to be a uniform schooling pattern for the whole country with a promise, again, for a radi-

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<sup>1</sup>Johri, B.M and Monohar Lal (1967), "Biology in Indian High Schools", *School Science*, Vol. 5, No. 1, p. 30

cal restructuring of school education. This calls for a fresh thinking for every phase of education, from school classroom to universities, for these phases are all interlinked. The place of school education is all the more important in the whole scheme as it lays the foundation both for those who would enter an early vocational life as well as for those who would continue for higher studies.

This period of transition provides a scope to look at the biology curriculum for schools in the light of the recent trends of theoretical developments in the subject. The growth of factual knowledge and theoretical scaffolding in biology necessitate inclusion of new facts, theories and concepts into the existing curriculum. But this is not enough. The approach to curriculum framing has also to be changed. A lot of cargo has to be jettisoned to make room for the new. This, however, leads to quite an intriguing situation and we shall discuss it later.

Along with the growth of factual knowledge comes another vital issue. The curriculum in any subject has to undergo a periodic ecdysis as and when the society demands a new generation of people framed and fashioned to a pattern relevant to its needs.

These two factors, in an ideal situation, should lend a live curriculum its essential character—an ever changing, meristematic process.

With this surfeit of premises, we come to the contemporary trends in biology and their correlation with the accepted goal of our new curriculum, i.e. service to the needs and prosperity of the people.

### *Current Trends in Biological Research*

In biology, like in all other major

branches of science, the broad outlines have been already determined. The present task is no more than filling in the details. For the observational studies the day-to-day business is to keep the picture up-to-date.

Ecology and studies of animal behaviour are now busy areas and they are directed towards the understanding of contemporary human problems. The knowledge of ecology has become an essential basis for land use and productive development. The looming eco-crisis has forced scientists from diverse disciplines into this field. Prospects of behavioural studies have attracted many a competent scientist towards ethology. The human conflict and eruption of violence in everyday life have ignited a renewed academic interest in animal and human aggression. Analytical studies from molecular to population level have gained solid theoretical foundation in these areas. Environmental studies require the most advanced techniques; satellite photography in the infrared has become the key-approach to large-scale work.

Relatively new materials come from the study of plant-growth substances. A number of items like indoleacetic acid and the gibberellins have come from non-plant sources. It has been known that "nutrients" like sulphur, iron or hydrogen are combined with oxygen by chemosynthetic bacteria to release energy. This energy is then used in basic food-making.

But the all-embracing approach which has almost assumed the role of *pars pro toto* is that of the so-called molecular biology. By molecular biology is usually meant the study of bio-molecules, their structures and their functional interplay. Such studies involve a profound financial support. More men and money have been applied to molecular biological studies



during last quarter of a century than to any other research in biology. There is no limit to molecular biological studies though, again, the broad outlines are well delineated. Except for the possible reversal of Crick's 'central dogma' and certain yet unrealized possibilities of genetic engineering, there are very few areas where a major theoretical break-through is in view. Nothing can distort the view that "most of the problems of genetic engineering will remain unsolved till the last syllable of recorded time"<sup>2</sup>. Still, molecular approach towards the understanding of biological phenomena is a strong wave in today's biology and it will continue to remain so for some more time.

#### *Reductionism and Holism : A Barren Dispute*

Side by side there is an age-old controversy in biology which has played a significant role in determining the course of biological research. It is the conflict between the two extremes in approach—reductionism and holism. The former usually finds its advocates in the field of what is called molecular biology. It indicates, according to the order of magnitude, the lowest level of investigation relevant to the biological systems. As it descends from top to down, it gains precision of information about fragments. Simultaneously, it loses information about the larger orders. Holism proceeds from the opposite direction and tries to retrieve the lost information by reconstruction. No information will be forthcoming, however, unless it had already been recorded earlier. For the last twenty-five years or so, gradually, the trend of biological researches has been shifted towards the understanding of molecular

interactions from more of a reductionist viewpoint. And to its credit, molecular biology has some of the most spectacular advances in modern biology. But in spite of all its success, the reductionist monopoly cannot explain all biological phenomena, nor can it issue injunction against supra-molecular principles in the understanding of biological systems. There is something like a supra-molecular order in the living systems. There is no phenomenon in the living body that is not molecular; there is none that is only molecular either.

Lest I am misunderstood, I hasten to add that molecular biology and reductionism are not synonymous. Ethological studies are not necessarily anti-reductionist studies. Similarly, understanding of gene-action may call for a holist analysis. The approach, or the emphasis of viewpoint is what is important in this connection, not the object of study.

Again, often we say that the whole is more than the sum of its parts. Here 'more' is an algebraic term referring to numbers. But when we talk of a biological system, the 'more' does not simply refer to any measurable quantity in the observed system. It refers to the supplementation of the sum of the statements about the separate parts to describe the collective behaviour of the parts in an organized group. This is somehow an upgrading process. It implies restoration of the information content that has been lost on the way down in the progressive analysis of the whole into the parts.

This I feel is a neutral version where lies the reconciliation between reductionism and holism. The differences between the two are determined as much by individual predilections as by historical traditions. In fact, there is no essential contradiction between them. A synthetic

<sup>2</sup>Burnet, M. (1973), *Genes, Dreams and Realities*, Pelican Book

view is possible. The same object can be seen from either of these two sides and it is like two individuals looking at the same object through a telescope from opposite ends.

Be that as it may, this conflict of ideas has a profound indirect influence on the present trend of biological research. Ideas degenerate, even those of the scientists and the trend of research is determined more by a host of commonplace reasons than by ideological convictions. As a result, there is the present popularity contest that centres around such monomaniac questions as—"Which is more important, the molecular research or those in the other fields?" Well, competence and resourcefulness of the scientist and the theoretical and practical implications of the study are the only valid criteria of the merit of research, no matter if one is surveying the vegetation of a jungle or trying to crystallize a newly known enzyme. Molecular biology is only a means of understanding biological phenomena at a particular level. It is not a separate discipline of biological science. In such issues, however, the balance of popularity is almost always tipped towards molecular biology and that too taking it as a separate field.

### *Framing the Curriculum*

I presume this piece of discussion is not quite irrelevant here because the trend of research is likely to be a factor which partly decides the trend of curriculum. There is supposed to be a continuous cycle in every field of education or that of higher education at any rate. The trend of research and the growing factual knowledge, at a given period, should flow into different curricular levels.

The younger students necessarily pass through these levels and some of them eventually come to the field of research. So, a rational curriculum for schools may ultimately influence the trend of research. If the researchers choose today to be preponderantly reductionists, the curriculum planners may try to find a well-balanced path emphasizing that reductionism and holism are only different ways of looking at the same thing. If the trend of research does not always follow a well-conceived logic, the curriculum is bound to follow one. If this is taken as a futuristic view, it will pay a rich dividend.

The society needs solution of its problems and those of food and health, of medicine and agriculture are largely biological problems. It is agreed by one and all that our curriculum should be a means of training the future generation in such a way that the scientists of tomorrow can face these problems and meet the needs of the society.

On the other hand, we do not disagree that the curriculum should be fed by the increasing factual development in biology. "But how much of the latter should go into the curriculum?" Or, still more important is the question of priority: "What should be taught and what should not be taught?" Answers to these questions have far-reaching significance.

Consider a simple example. Scientists have produced the world's first animal-plant organisms by fusing the red blood cell with the yeast protoplast. This hybrid tissue can grow and develop indefinitely and is considered to be a significant achievement in biology. Tomorrow it can be used as a source of cheap protein. Are we going to narrate this example, say, in an advanced class?

Inclusion of such discoveries would go on increasing the total information

content in the curriculum. Contrarily, can we afford to omit them? Should we deprive our students of the new and significant discoveries?

Well, this is just an example but similar achievements in biology are only too common and we have to take a reasonable line of action. Cheap and easily available supplementary reading materials on selected topics may be a partial answer.

### *"Of What Use is a New Born Baby?"*

Albert Einstein was once asked, "Of what use are the vague scientific discoveries?" "Of what use is a new born baby?" was the instant repartee from the scientist. Everything that is discovered today does not have an immediate application value. But many apparently useless pieces of information may be of immense theoretical significance for a distant future. We cannot choose to keep away from them, for that would gradually leave the budding scientists and researchers ignorant of such developments in biology which would be the basis of tomorrow's science and technology. More serious issue is that such a decision would gradually narrow down the entire field of scientific thought. Myopia, in extreme cases, may lead to blindness. Fundamental researches, even without an apparent and immediate application value, are a resource.

What I want to drive at is that both the immediate and the long term utility of research findings should be exploited in the interest of science as well as society. It is better if the training for such exploitation starts right from the school level. If the school curriculum be an answer to the needs of the society, it is equally apt an answer to create scientists of tomorrow who should not be out of place with respect to the future development of science.

I am inclined to consider another point. Science as a discipline is an instrument for social changes and an answer to the immediate social needs. On the other hand, science has no particular social or national obligation. Beyond the national barriers, there is an ever receding horizon of scientific knowledge which has to be chased without a pause, without a truce, without a rest. On one hand, it is the moral obligation of a biologist to find answers to the global problems of food, of overpopulation, of cancer, of our polluted environment. On the other hand, a biologist also speculates over the possibilities of buoyant organisms in the upper atmosphere of Venus. Neglect of the first would bring us disaster but that of the other would keep us ignorant.

### *Quantity of Information vs. Process and Product of Science*

I left this issue undiscussed in the beginning of this essay. When we think of incorporating new achievements of biology into the curriculum, the question of quantitative proliferation of the subject becomes imminent. Simultaneously, anything that is old is not necessarily obsolete. There are the classical concepts which have stood the test of time. As an answer to this question, it is frequently emphasized that the process of science rather than its product should guide the curriculum and that this would keep the content-load to a minimum. In other words, internal conduct of science instead of its external impact is what is important in the teaching of science. Or, in the phrases of Descartes, what is important is not the objects of science but the operations of the inquiring mind.

A few points seem to be relevant in this connection. First, is it always possible to separate the methods of science

from its products? It may not be as easy a job as it seems. Even when it is possible, it would demand some "sacrifice of specialists' *amour propre* and curriculum claims"<sup>3</sup> and also a great deal of ingenuity to distinguish between the process and the product. And then, understanding of the process without its objective relevance in the product may suffer an ultimate conceptual limitation. After all, the methods of science are everywhere the same but the nature of their products are diverse.

Secondly, an overemphasis on the process may eventually lead to theory-based concepts and we have to be careful that teaching of science does not turn into a game of ideas alone. When we proceed from the idea to the thing, there is always the risk that clarity of an idea would not entail, of necessity, the existence of its object. When all is said, it remains that there is a remarkable growth of scientific facts and that they should be known to the students.

Besides, the process of science is not immutable. I agree that we do not get every morning a *novum organum*; new methods are not born overnight. But they do evolve along with the products of science, silently, gradually and often unnoticed. So, understanding of the products of science may conversely help in understanding of the process.

But does all this help us solve our baffling problem—the quantity of information to be transmitted to the students? Certainly there are as many opinions as there are heads. But this is not an isolated issue and needs to be weighed in terms of other factors which have been discussed in these pages.

### *Biology: Today, Tomorrow and the Day After*

It was all in search of the perspective that I have travelled in a wayward course. Here I try to re-emphasize a few points before I close.

First, the now hackneyed 'social relevance' of science should imply the relevance of science to the future society too, even if it is too distant a future. This is particularly true in relation to education. If we accept that education is a carrier of human heritage, we need to agree that it has to carry a good number of what we call in evolutionary terms the 'recessive genes'. The story of evolution shows that these cinderella genes often emerge quite unpredictably as factors of great survival value. The analogy may be far-fetched but it holds good when we talk about scientific knowledge of no apparent importance in the contemporary scene. A number of them may prove useful in remote future. So, a careful selection of such futuristic concepts is desirable for biology curriculum. I agree, however, that it demands a vision and ingenuity to make out such concepts out of the plethora of research findings.

Secondly, those of us who are somehow associated with the framing of biology curriculum for advanced classes have frequently experienced a general tendency, deliberate or otherwise, of emphasizing molecular biological components from an extremely reductionist viewpoint. To succumb to this will be dangerous. Biological principles are to be conceived essentially from the holist standpoint with a simultaneous understanding of the behaviour of the fragments. A unified picture of phenomenal reality in the biological world is what we should like our students to grasp. Synthesis rather than contradiction between reductionism and

<sup>3</sup>Huxley, J. (1966), *Essays of a Humanist*, Pelican Book

holism would be a better guide to modern biology. If this synthetic approach is infused in our school curriculum, in not too distant future the new generation of scientists will have a broader conceptual base and better view of the perspective than we have had.

Finally, apart from the scientific endeavours which yield fruits for human benefit, there are those with no apparent material value. They give man the joy of understanding. And this is a deliberate repetition of my earlier view that students of science at all levels should be trained to attach respective values to both the kinds. If the former serves the society materially, the other kind satisfies the aspirations of those who want to know and understand. I would like to believe that this is a more catholic interpretation of education in relation to the needs and aspirations of the society. □

# From Biology to Life Science

## Impact of this Change on Biology Education

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BIOLOGY is the science of life. It deals with plants and animals including man. In spite of that for a long time in the area of science and its education the status of biology was very low. In the field of school education, it was considered only as a prerequisite for medical profession. Only recently, the importance of biology has been realized. This realization is due to the rapid growth of biology which has made tremendous impact on the social changes. The character of biology has completely changed today. What was once regarded as a "shotgun marriage of plants and animals" & (Simpson, Beck, 1959) has resulted into

the coming of several disciplines, all attempting to explore the mysteries of life. Biology of yesterday has become today's Life Science and its teaching has become specially important. And during this period the science education has undergone revolutionary changes (Bybee 1974). How can both these changes (change in the character of the subject and change in the teaching method) be reflected properly in the teaching of today's life science?

In order to find out the answer one must look back into the history of biology, contemporary characters of its different areas, reasons for the changed

approach, the past and present of biology education and requirements for the future life science education.

### HISTORY OF THE PROBE

The history of biology indicates that its growth was not by *accretion*. On the contrary, like a living organism, it developed with changes. In each generation the quantum of knowledge was increased through new ideas, new facts and new techniques. The new knowledge led to the formation and restructuring of the old concepts.

The term "Biology" was first coined by a French naturalist Jean Baptiste Lamarck in the late eighteenth century, but long before that mankind learnt to cultivate plants and to domesticate animals. As a hunter and as well as for safety, he learnt the behaviours of animals. Fish as the food attracted him to the life in water. His needs forced him to improve the qualities of cultivated plants and domesticated animals. *The improvement was done without knowing the underlying principles.* He discovered the medicinal importance of many plants and animals. The works of Charaka and Sushruta in ancient India tell us about the extensive nature of these documents. The correct description of body parts of man, animals and plants in the *Mahabharata* also speaks of the then existing accuracy of knowledge. Biology as it is known today is based on the foundation of the efforts of several centuries, the recorded history of which is available from the time of Aristotle.

The history of biology up to the beginning of the twentieth century includes several breakthroughs. The first one came in the sixteenth through Vesalius, who introduced the method—"observe

what you see." It challenged many of the notions of Aristotle and Galen, who explained observed phenomena only by imagination.

The second breakthrough was the discovery of blood circulation by Harvey to confirm that the "force of life" is within the body. The finding of Lavoisier and Laplace, that elements of living organisms are the same as that of the non-living, resulted in the beginning of the chemical analysis of living organisms. Here, for the first time, chemistry combined with biology and denoted the beginning of bio-chemistry. The invention of the physical instrument, microscope and its use may be regarded as the coming together of physics and biology. With the help of microscope, the cell was discovered and later was established as the unit of the living organism. The coming of the theory of natural selection by Charles Darwin brought biology into limelight. It explained the origin of the diversity in this living world and the relationship between different living forms. It stirred the entire thinking of the mankind. Almost simultaneously came Darwin's theory and certain laws formulated by an Austrian monk, Gregor John Mendel, who attempted to explain the transmission of characters from one generation to the other. But Mendel's discovery went unnoticed. It was rediscovered in the year 1900 and denoted the beginning of a new era of biology.

### NEW ERA OF BIOLOGY

For a long time, the living organisms were believed to be the citizens of two worlds—plant and animal. Botany (the study of plants) and zoology (the study of animals) advanced independently. Mor-

phology, anatomy, physiology, cytology, ecology, genetics, embryology, taxonomy and evolution were the conventional subdivisions of botany and zoology. No one ever dreamt that there might be any unity in the organization of plants and animals.

The new era of biology which started with the rediscovery of Mendelism advanced in two directions.

One direction was to search the level of unity and the other direction was to know the extent of diversity. The result was that the fundamental unity in the living world was understood and the extent of diversity was known in detail. During this advancement many old subdivisions disappeared and new compartments developed through the combination of the old compartments. Several old compartments changed their approach and searchings took a new direction. (Handler, 1970)

#### FROM BIOLOGY TO LIFE SCIENCE

The developments in the different areas of biology reached a point where the discipline demanded the techniques, skills and training of other disciplines. Physics, chemistry, mathematics, computer sciences, geology, electronics and graphic arts came into the fields of biology. The net result was that from biology, which was once only one discipline, came out several disciplines: bio-physics, biochemistry, biometry, bio-medicine and bio-engineering. The findings of these new disciplines have changed the approaches of the different areas of biology like morphology, anatomy, ecology, systematics and evolution. There are a few other disciplines which also deal with the study of life. These are agriculture, medicine, anthropology, psychology and sociology. Now these dis-

ciplines are dependent upon the basic knowledge of biology. Biology and all the new disciplines which have emerged from it and other disciplines which also deal with life are together known as Life Sciences. The significance of the term "Life Sciences" has been realized only recently, when the inter-relationship of the different disciplines has been correctly understood.

The life science of today differs from the biology of yesterday in the new approach. This originated from the consequences of human acts and from the dangers that are threatening the future.

In the sixties of this century it was realized that in his eagerness to control the nature, man has completely upset the balance of nature. The progress towards the solution of basic problems—food, shelter and diseases—has caused rapid increase of population, demanding more food, more space and more health measures. The crowded society is polluting the environment, exhausting the natural resources, creating noise, increasing tension and new social problems are cropping up.

While the efforts to solve these problems are continuing, it has been realized that instead of attempting to control the nature, man must learn how to coexist with it. And this demands a complete change in the human behaviour. Man must know his own behaviour and his interaction with the environment.

All these modern problems can be solved only through the proper study of life science. In order to fulfil the above-mentioned objectives the emphasis of today's life science has been shifted from plants and animals to human beings. Human beings are regarded as the central figures in all its studies. Life Science is



trying to find out how man can change his behaviour, how he can fruitfully interact with other living organisms and how he can live effectively in his environment. The answers to these are bound to make a major social change.

### GROWTH OF BIOLOGY AND BIOLOGY EDUCATION

There exists a fundamental difference between science as a discipline and the science as a subject for education. The growth of science as discipline takes place through research studies. All these studies are written in a language which is understandable only to a few specialists. The research areas have become so much specialized that it is often not understood by someone working in another area. For this reason the biological sciences also are presented in an assimilable form for the purpose of teaching.

How far has the growth of biology influenced the biology education? Or in other words, if the purpose of education is to prepare the next generation to carry the mantle of the previous generation of scientists, to what extent was the biology education effective? What kind of biology education was there in the past? How has it acquired its present form? What would be the biology education for the future?

But before that we should remember that biology education is a part of science education and, in its turn, is guided by the common philosophies of education. The purpose of education is to develop understanding, knowledge, skills and to develop certain positive attitudes to live effectively in the existing social condition. The word "effectively" has special significance. It means that in each generation, mankind, while utilizing the experience of

the previous generation, will also acquire new experience and will contribute towards the growth of human culture. That is why the methods of education has always changed to cope up with the changed character of the discipline, suiting the existing social condition. Biology education is no exception to it. But, has it changed with the changes in the character of biology? Can biology education be treated today as a discipline fully equipped to meet the trends of life science?

### BIOLOGY EDUCATION OF THE PAST

The evolution of biology education may be divided into following phases :

- Phase 1* Education of the adults for specialized areas of biology.
- Phase 2* Preparation of students for colleges and universities.
- Phase 3.* More emphasis on the needs of teaching-learning than on the contemporary knowledge.

#### *Phase 1*

In this phase, the pursuit of science was considered as the job of a privileged few. While the common man without understanding the significance carried his experience about plants and animals from one generation to the other, the researches and formal education were considered to be the affairs of the specialists. The students who wanted to learn had to stay with the master as disciples and the education was essentially adult education. The impact of teachers like Aristotle or Galen was so profound that their words were taken as gospel truth for the next couple of centuries. The result was that science, including biology, made no signi-

ficant progress during that period.

In the later period, when institution-based training joined the individual-centred education, a new wave came up. The reporting of *observation* by actual seeing became the motto and the students learnt about human body, plants and animals from the teachers in the universities and medical colleges. This trend continued up to nineteenth century.

### Phase 2

Darwin's theory brought biology into limelight. It not only changed the character of biology but also made a great impact on human thinking. It was thought necessary to introduce biology at the high school level in the U.S.A. and U.K. The courses in the high school fully reflected the contemporary status of the discipline, but being only preparatory for the universities, were not well-rounded. For this reason, the majority of students who did not go to the colleges, the course was incomplete and thus served no purpose. This phase continued in the U.K. up to 1957 and in India it lingered up to 1967 (Johri & Manohar Lal, 1967).

### Phase 3

This phase occurred in the U.S.A. during 1929-1957, when the courses were modified extensively but not fundamentally. The emphasis was given to the requirements of the newly born theories of teaching and learning. In fulfilling this task, the content was selected by ignoring the state of knowledge in the scientific field. The content was changed to such an extent that it gave a distorted view of the contemporary knowledge. There were other reasons for distorting the content. One was to fulfil the needs and interests of different classes in the community. The second was to

meet the scarcity of properly trained teachers.

The condition in the U.K. remained in Phase 2 for a long time and thus was not affected by the problems of Phase 3. There very little changes were made in the school curriculum till the late fifties, though sustained efforts continued, demanding changes (Huxley, 1922; Shann, 1929; Cawthorne, 1930; Griffiths, 1936; Towers, 1941; Ramage, 1942; Johnson, 1942; Russel, 1946; Brown, 1953; Green, 1954,

### BIOLOGY EDUCATION OF THE PRESENT

The present trend made its beginning in the U.S.A. but soon it spread almost all over the world. The main purpose was to bring school education closer to the real "state of art". The classroom teachers, administrators and scientists worked together. The developments of biology education have taken place along the line of thinking of science education and are based on the theory of *curriculum development* (Brunner, 1960). According to this theory, each discipline has several elements. For the purpose of training, these elements are to be meaningfully arranged to form a *structure*. The students, while learning this structure will gradually realize the breadth and depth of the discipline. This theory was widely appreciated because (i) it suited the existing learning theories; (ii) it facilitated the publication of instructional materials; (iii) it offered easier methods to train teachers, and (iv) it made the assessment of the teachers' performance easier.

In the year 1962, representatives of twenty countries met at Switzerland (OECD, 1963) and while discussing the conditions of biology education, pinpointed the following deficiencies.

- 1 Compared to the total enrolment, very few students take up biology (because science is not compulsory for all).
- 2 Those who learn, learn too little.
- 3 In most cases, the ways of learning are scientifically and pedagogically unsound.
- 4 Content leaves out important modern findings.
- 5 Teaching of biology is not integrated into the rest of the National Science Curriculum.

The following reasons were identified as causes of the deficiencies.

1. The conviction that the pupils must not be overloaded tended to underestimate the study of biology.
2. Conservative attitude of the biologists;
3. The significance of the science of biology is not generally understood by the society.
4. The spectacular progress made in physico-chemical and engineering technology makes the learners underestimate the science of biology.
5. Confusion regarding the relationship between pure and applied biology.
6. Smallness of scale and lack of coordination in the efforts to bring reform.

The first Asian Regional Conference on School Biology held in 1966, recommended the following criteria for School Biology (Johri & Manohar Lal, 1967)

1. It must inculcate the idea of Science as inquiry.

2. It must consider the pertinent problems and need of the community and emphasize the study of local flora and fauna.
3. It must be presented in a logical and coherent manner based on the following themes.
  - (a) The intellectual history of biological concepts.
  - (b) The change of living things through time (evolution)
  - (c) Diversity of type and unity of pattern in living things
  - (d) The genetic continuity of life.
  - (e) Interdependence of organism and environment.
  - (f) Biological roots of behaviour
  - (g) Corelation (complementarity) of structure and function.
  - (h) Regulation and preservation of life in the face of change.
4. The class time allocated to the subject shall ideally be not less than 180 full hours.
5. The content must correlate biology with other school subjects.
6. Consideration should be given to the best information available regarding students' learning processes".

Efforts along these lines began in almost all the countries to strengthen biology education. Biology was introduced at the lowest level of the school, the practicals and other activities were introduced, contents were selected to fulfil well defined objectives, teacher training was expedited and entire programme was evaluated.

Different methods of teaching were introduced, for example, lecture-cum-demonstration, process-oriented teaching, inquiry approach, investigatory projects, etc. A number of teaching aids were produced to provide more learning experi-

ence. From a college oriented course with disjointed and backdated topics and elementary generalization, a balanced course was developed.

While all these efforts were in progress, the early seventies of this century witnessed a radical change in science education. The new wave began in 1959, when Richard Jones claimed that materials developed according to the theory of curriculum development have selected contents which leaned heavily to fulfil the cognitive objectives. These teacher-centred curriculum desires the students to become an encyclopaedia of facts and to acquire robot-like skills. The prime goal of education—the development of attitudes—was completely missing. According to Jones, in this type of curriculum, the teachers are busy in their classes to complete the course and have no time to see whether all the students have really learnt or not. In the absence of individual attention, it is never assessed whether scientific attitudes have developed or not. The students come across large number of books in the classroom, but loses interest in reading. They master many complex skills but fail to use scientific methods in solving the daily problems of living.

Jones proposed the *theory of instruction* as opposed to the theory of curriculum development and claimed that fulfilment of the objective of effective domain should be the top priority in science education.

The views forwarded by Jones soon got support from others and the proponents of the theory of curriculum development modified their thinking (Brunner, 1971, 1973). In the synthesis of the two it was proposed that both the content and instruction are important and curriculum of science should be developed accord-

ingly. At this stage biology became life science. Hall & Moog (1955) introduced the term life science in place of biology. Simpson and Beck (1957) stressed on the general principles but did not emphasized man as the central core. But more and more people were (gradually) convinced that the main focus of the study of life should be shifted from plants and animals to man. The future citizens are to share the contemporary knowledge on the subject in such a way that they learn to improve upon their human qualities. The attainment of such qualities alone can help to solve the daily life problems and on the successful solution of these problems will depend the human culture. All the purposes of science education can be fulfilled best through life science education.

#### PLANNING OF THE LIFE SCIENCE EDUCATION

The success of life science education at the school level depends upon (i) careful selection of the contents to reflect contemporary knowledge, (ii) identification of values to make the education meaningful, and (iii) adoption of new techniques of instruction. The objectives of both cognitive and affective domain are to be selected carefully and attempts should be made to fulfil these objectives in a phase-wise manner and according to the age-group of the student.

##### *Selection of the Content*

While selecting the content according to the ability of the students, it is necessary to fulfil the following conditions.

1. All areas of life science must get equal emphasis.

2. The students should be able to realize his own position in the living world and his role as a human being
3. The students should develop a sense of respect about the plants and animals around him.
4. Both the historical aspects and future trends are properly reflected.
5. It helps to develop abilities to solve day to day problems and thus inculcates certain positive values.
6. It is helpful for undertaking higher studies

In order to perform the above task, the learning abilities of different age-groups are to be specially considered. Up to the age group 11+, the efforts should be confined to the development of familiarity with the plants and animals in the environment. They should be provided with opportunities to have more experience through observation, so that a feeling of respect about the living organisms may grow in their mind. As this is the habit-forming age, knowledge about the parts of his own body and their functions will help to develop proper health habits. In between 11+ and 13+, the students develop the power of reasoning. They already have many experience of their own about plants and animals, the content presented must codify these experience. Instead of presenting the contents as topics, it should be presented in the form of problems and questions. This will enable the students to understand and cope with the environment and such understanding is valid for the disciplines.

The same approach may be extended to the age group 14+, and 16+. The methods of science should be highlighted through the presentation of topics from

different areas of biology. This will enable the students to realize the common way to acquire knowledge in all the areas of biology. While knowing the facts, they will understand the needs of rational thinking, open-mindedness, amenability to reason and construction of arguments in solving scientific problems.

In the higher secondary class, i.e. 16+ to 18+, the contents must be presented to develop a base for entering various academic or professional lines, and to develop a clear understanding about the significance of his biological background in his daily life. The students must be fully aware of the modern trends in the various areas of biology and must develop certain specific skills for taking up higher studies.

#### *Identification of Values and Abilities*

The main focus of life science education is on man. For this reason the teaching of life science can play a major role in the inculcation and propagation of values which are urgently needed to bring about social change. For this reason, while presenting the content it is necessary to identify the values which are to be met through life science. The following values and abilities mentioned in the framework of 10 years' curriculum (NCERT 1975) can be attained through the pursuit of life science.

1. Understanding of the environment,
2. Problem-solving and decision-making abilities,
3. Knowing the past,
4. Proper ability to measure and to estimate,
5. Need for hard work,
6. Dignity of labour,
7. Equality, and respect for others,

8. Human dignity,
9. Concept of organization,
10. Creative and innovative thinking,
11. Change and amenability to change,
12. Efficiency in thought and action,
13. Concern for the problems of the present and future like pollution, conservation, overpopulation, water, power, food, health and sanitation,
14. Aesthetic sense,
15. Scientific attitude towards custom, contention, fraction, age, obscurantism, superstition, dogma and half-truths,
16. Development of personal qualities.

### *New Techniques of Instruction*

The change of biology to life science and change in the approach of science education demand new techniques of instruction. This has become specially important for our country, when we are introducing the new ten plus two curriculum. The science in this new curriculum differs from the science in the previous curriculum on two important points. (i) up to Class X, science is compulsory for *all* students, and (ii) main emphasis is laid on the development of *scientific attitudes*. It is not possible either to bring science to all or to develop scientific attitudes with the prevalent methods of teaching. As the teacher is busy in completing the course, he has little time to find whether all students have learnt or not. If this continues, then nearly 50 per cent of the students will have to be satisfied only with the memory of once attending science classes. The personal contact of the teacher is the most desired thing, which alone can bring

science to all and can develop scientific attitudes. Such personal contact is possible only if the teachers follow new techniques of instruction, specially in the teaching of life sciences. This demands a meaningful teachers' training programme which can alone equip our teachers with the new methods of instruction.

The existing teachers' training programme tend to emphasize the philosophy, history and theoretical psychology of education. From the academic point of view, this knowledge is important, but most of the teachers, at the end of their training, find this knowledge ineffective in the classroom. The teacher learns to prepare a good lesson plan, but he just does not know what to do if one planned experiment fails during demonstration. The training should be such that lesson plan does not become the goal of a lesson but only remains a guideline.

In certain States, some contents have been added to the syllabus of the training colleges. This is taught just like a refresher course to a group who are poor in content. There is no doubt that for qualitative improvement such discussions on the topics of contemporary importance are needed. But is that all what is needed? The teachers would like to know the details of how these topics can be taught in the classroom.

As discussed earlier, in order to make the 10+2 curriculum successful, most important requirement is to *personalize science teaching*. This is possible only through personal contact. How can a teacher personalize science teaching in an overcrowded classroom? While carrying out the responsibility of completing the course content, how can a teacher develop personal contact with his students. The answers are difficult; but since the task is extremely important, the answers must be

provided to the teacher during his training. Today several new methods of teaching, e.g. new modes of communication, are available. If the teacher knows how to use them, he may employ it in his class, so that he is able to communicate with the majority of his students. Together with the new methods of teaching, a teacher must be told how to behave in the classroom. How to react? How to accept the students? How to motivate them? These are a few of the many questions, which should be answered during the training programme.

In order to make the training programme meaningful the following ideas may be tried.

- (1) To select and practise those activities which will offer challenge to the pupil, but must have the maximum opportunity of success.
- (2) Examples of giving personal encouragement to each student as far as possible.
- (3) How to encourage cooperation rather than competition
- (4) How to take the errors and mistakes as a part of developing, learning and growing.
- (5) How to allow some freedom within the defined limits
- (6) How to provide experiences that are positive, realistic and within the abilities of individual students.
- (7) How to use the facilities of the environment in developing the objectives of a particular lesson

A teacher of life science while learning the above-mentioned components, should also know the following.

#### I. *Contemporary developments in biology curriculum around the world and India*

The last 15 years have witnessed a

number of biology curriculum materials developed in the U.S.A., Europe and in India (Kelly, 1967, 1971; Kalmus, 1967, Norris, 1969, Lockard, 1970; Dowdswell, 1967 a, b, 1970; Globman, 1959; Hurd, 1959, Woodford, 1972; Peterson, 1964; Doraiswami, 1970; Perrywilliams and Pullan, 1971; Lecog, 1969, Clayre, 1974). A broad familiarity with these foreign materials is required, but the details of the Indian materials must be known. Such details include syllabus, textbook, teachers' guide, kits, kit guide, films, slides and charts

#### II *Theoretical basis of restructuring biology curriculum*

The production of materials in science education is based on extensive intellectual pursuit (Hurd, 1962, 1966, 1970; Burnett, 1963; Hutchinson, 1964 a, b; Barnes, 1967, Kelson 1967, Periot, 1967; Drugel, 1969, Hardin, 1970; Jannings, 1969; Ehrlei, 1970; Koran Jr., 1971). A detailed discussion of such thinking in the restructuring of the biology curriculum is needed. The materials developed in the U.K. under STEP project (1974) is most important. For the theoretical basis of the restructuring of biology and its aims and objectives, the works of Balzer (1970), Montean (1970), Reid & Book (1970) are extremely important.

#### III. *Development and use of teaching aids*

In recent years, the importance of the teaching aids has been amply realized specially in connection with the crowded classroom. Much efforts have been made to fully exploit the different teaching aids. Thus, mere skill in developing teaching aid is not enough. In order to equip the teacher properly, the following aspects of teaching aids in life science must be emphasized.

- (1) General discussion (Stance, 1967)
- (2) Drawing and observation (Bremner, 1962)
- (3) Programme learning (Wong, 1964; Wilson, 1968; Diamond and Benton, 1970)
- (4) Models (Ashworth and Fieldhouse, 1971; Kemp, 1971; Kramer, 1971; Whitaker and Walker, 1973; Ramsay, 1973; Forsyth, 1973)
- (5) Overhead projector (Harper, 1974)
- (6) Films (Gibbs, 1962; Kennedy, 1967; Neal, 1967; Kempers, 1970; Hinchcliffe, 1972; Goodhue, 1975)
- (7) Audio-tutorials (Defler, 1966; Elwell, 1967)
- (3) Helminthes and Annelids (Evans and Golding, 1965, Behringer, 1966; Galen, 1971, Hinchcliffe, 1973)
- (4) Fish—Gillespie (1953)
- (5) Birds—Evans (1968) — Cameron, 1969; Whitten, 1971
- (6) Mammals (Cameron, 1970)

#### IV. Use of living organisms

A decade ago, the teaching of biology was done through the study of plants and dead animals. The subject was often ironically referred to as *necrology*. This approach has been changed. A number of living organisms are required today at school level for teaching biology. The handling of different living organisms, both in the classroom and in the field (Grobman, 1966; Scott, 1967; Wyatt, 1967; Kelly and Wray, 1971; Shapely and Coulter, 1971; Boorer, 1967), requires specific knowledge and skills on the part of the teacher. The works of Woolever (1973) and Dobkin (1964, a, b, c, d, e) are worth mentioning in this connection. Information regarding preparation and maintenance cultures of different organisms may be obtained from the following.

- (1) Fungus and Micro-organisms (Mullenger and Gill, 1973, Vigel, 1969; Cunnell, 1963)
- (2) Insect Culture (Busvine, 1958; Fry, 1961; Corbet, 1970, Jagiello, 1970; Greenwood, 1973; Hansell, 1973)

#### V. Organization of biology laboratory

The experience of a biology teacher about a biology laboratory originates from his college or university experience. He wants to replicate similar situation in his school. This creates a great problem. The set-up and requirements of a school are entirely different from that of a college or a university. A teacher must know how he can utilize the best of his existing sources to facilitate his teaching. How to buy equipment and various other materials? What to buy? Where to keep these equipment? What care is to be taken? Which materials are needed for the class? Which safety measures are to be followed? The answers to these questions must be known to the teacher. The book of Kramer (1974) is the best reading material for the purpose.

#### VI. Teaching of certain important areas of biology

Biology today includes certain areas which were formerly beyond the school level. Special care should be taken towards the teaching of these areas. The mechanism to teach such areas are well illustrated by different workers.

- (1) Agriculture (Auckland and Weatherup, 1973)
- (2) Autoradiography (Garatun, 1970; Parry Williams and Servant, 1970; Hornsey, 1970)
- (4) Biochemistry (Wilson, 1967;



- Cooper, 1967, Freeland, 1971, 1972 a, b, Wyatt, 1974)
- (4) Ecology (Brown, 1967, Bishop and Bradley, 1972, Angseesing, 1975, Lenton, 1975)
  - (5) Evolution and Genetics (Tucker, 1967, Bishun, 1968, Angseesing, 1972; Dudley, 1973, a, b, Balls and Godsell, 1973)

#### VII. *Techniques of evaluating the biology curriculum*

Evaluation of the curriculum is necessary not to judge the students' achievement alone, but also to analyse the teacher's own performance. This will enable the teacher to rectify his own teaching. A wide extent of literature is available on the evaluation of biology curriculum (Degenhardt, 1965; Tamir, 1971; Ashworth, 1972; Rowe, 1972, Thomas, 1972, Varley, 1972; Wyatt, 1973; Kelly & Monger, 1973 a, b, Kelly, 1972).

#### TRAINING OF ELEMENTARY SCHOOL TEACHER

The elementary school teachers, specially those in the primary schools, work in the most deplorable conditions but are responsible for the most important part of the 10+2 curriculum. In most primary schools, he alone is to teach not only science but also other subjects. In his training special emphasis should be given on following aspects.

1. How to link science with other branches of knowledge
2. How to utilize daily life situations in explaining scientific principles.
3. How to organize the classroom.
4. How to organize field trips.
5. How to fulfil the objectives of science in the most adverse conditions where least facilities to im-

plement the curriculum are available

6. How to develop visual materials for the use in teaching
7. How to be familiar with the immediate environment and best use of it in teaching.

The science in 10+2 curriculum at the primary level is environment-based. Therefore the knowledge of biology (specially names of common plants and animals, their habits & habitats, agriculture, ecology) will be essential.

#### CONCLUSION

The science of biology is as old as human history. The search to solve the problems of food, shelter and diseases is still continuing. This search has repeatedly changed its approach. The latest one being the coming of life science. It aims not only to the problems of food, shelter and diseases but also to the problems of human culture. Never before, the pursuit of science came so close to the pursuit of social sciences, in inculcating and propagating certain common values to which the entire mankind is committed today.

While biology was becoming life science, the science education underwent an important change. The emphasis of education was shifted from content to content-cum-instruction.

These two changes together with the needs of our new 10+2 curriculum demand a new role of our classroom teacher to play in the implementation of this new thinking. A teacher of life science must have adequate knowledge about the contents of all the disciplines and must be fully aware of the values and abilities to be attained. With this he must blend his skill of teaching, which alone can make the life science education truly successful.

## REFERENCES

- ANGSIRISING, J.P.A., "Unquiet Evolution: Consideration of a Previous Synthesis," *J Biol Education*, Vol. 6, 1972, pp. 41-45
- , "Ecological Genetics in the Field," *J Biol. Education*, Vol. 9,1, 1975, pp. 17-20
- ASHWORTH, J.M. and J. FIFTHOUSE, "An Inexpensive and Accurate Method of Constructing Molecular Models," *J. Biol. Education*, Vol. 5, 1971
- ASHWORTH, J.M. "The Use of Multiple Choice Tests in Biological Teaching," *J Biol Education*, Vol. 6, 1972, pp. 308-310
- AUCKLAND, J.N. and WEATHERUP, "Some Performance Characteristics of Students Taking the National Certificate of Agriculture", *J. Biol. Education*, Vol. 7, 1973, pp. 47-49
- BALLS, M. and P.M. GODSELL, "The Life Cycle of the Cell," *J Biol. Education*, Vol. 7, 1973, pp. 24-30
- BALZER, L.V., "Teacher Behaviours and Student Inquiry in Biology," *The American Biology Teacher*, Vol. 32, pp. 26-28, 1970
- BARNES, W., "Biology and the B Ed. Degree," *J Biol. Education*, Vol. 1, 1967, pp. 13-18
- BEHRINGER, M.P., "An Experiment with Vinegarcel," *BSCS Newsletter*, Vol. 29, 1966, pp. 6-7
- BISHOP, J.A. and J.S. BRADLEY, "Taxicabs as Subject for a Population Study," *J. Biol Education*, Vol. 6, 1972, pp. 227-231
- BISHUN, N.P., "The Normal Human Karyotype," *J. Biol. Education*, Vol. 2, 1968, pp. 13-20
- BOORER, M.K., "Zoos as Teaching Aids," *J. Biol Education*, Vol. 1, 1967, pp. 233-238
- BREMNER, J. "Drawing and Observation in Biology Lessons," *The School Science Review*, Vol. 43, No. 151, 1960, pp. 631-639
- BROWN, T.J., "Comparative Ecology of Protozoa. A Laboratory Exercise for Undergraduates," *J. Biol Education*, Vol. 1, 1967, pp. 161-167
- BRUNER, J.S. *The Process of Education*, Howard University Press, Cambridge, Massachusetts, U.S.A., 1960
- , *The Process of Education Reconsidered from Dare to Care/Dare to Act: Racism and Education*, (Ed.) R.R. Leeper, Association for Supervision and Curriculum Development, Washington D.C., U.S.A., 1971
- , *The Relevance of Education*, W.W. Norton & Co., Inc., New York, U.S.A. 1973
- BURNETT, R.W., "New Concepts in the Education of Science Teachers," *Jour. Res. in Science Teaching*, 1963
- BUSVINE, J.R., "Housefly Colonies for School Biology," *J Inst Biol.*, Vol. 6, 1958, pp. 1
- BYBEE, R.W., *Personalizing Science Teaching*, National Science Teachers Association, Washington, 1974
- CAMERON, J.A., "The Japanese Quail, *Coturnix Japonica* - Its Utility in Classroom Practical Work," *J. Biol Education*, Vol. 3, 1969, pp. 173-179.
- , "Keeping Small Mammals in Schools—A Note on Maintenance Costs," *J. Biol. Education*, Vol. 4, 1970, pp. 247-249
- CARR, C. and D. TOMBLEY, "Education Technology in the Training of Biology Teachers," *J. Biol. Education*, Vol. 9, 1, 1975, pp. 5-9
- CLAYRE, D. CHR., "The Danish Higher Qualifying Examination New 1-Year Course Biol System," *J. Biol. Education*, Vol. 8, 1974, pp. 352-354
- COOPER, R., "The Colorimetric Measurement of Succinate Dehydrogenase Activity in Sub-cellular Fraction," *J. Biol. Education*, Vol. 1, 1967, pp. 57-67
- CORBET, S.A., "Insect on Hogweed Flowers: A Suggestion for a Student Project," *J Biol. Education*, Vol. 4., 1970, pp. 133-143

- CUNNELL, G J., "Studying Fungi in Schools," *School Science Review*, Vol 45, 1963, pp. 93
- DEFLER, D J., "Using Closed Circuit Television with Biological Science Curriculum Study Material," *The American Biology Teacher*, Vol 28, 1966, pp 699-703
- DUGENHARDT, E.F., "Practical Analysis of Teacher-Made Objective Questions," *The American Biology Teacher*, Vol 27, 1965, pp 755-758
- DIAMOND, R M and A. H BENTON, "An Experimental Programmed Laboratory in Biology for the Non-Major," *J Biol Education*, Vol 4, 1970, pp. 111-114
- DORKIN, J. "Laboratory Exercise on Marine Organisms," *BSCS Newsletter*, Vol 20, 1974, pp. 9-10
- "Laboratory Exercise on Agar-Eaters," *BSCS Newsletter*, Vol. 20, 1964, pp 11
- "Laboratory Exercise on Light Marking Bacteria," *BSCS Newsletter*, Vol 21, 1964, pp. 34-35
- "Laboratory Exercise on the Blood of Invertebrates," *BSCS Newsletter*, Vol. 20, 1964, pp 14-15
- DORAISWAMI, S. "The New Biology Syllabus in India for Middle and Senior High Schools," *J Biol. Education*, Vol 4, 1970, pp 11-17
- DOWDESWELL, W.H., "Nuffield I. Biology 11-16," *The School Science Review*, Vol. 48, 1967, pp. 323-331
- "The Nuffield Biology Project at O-Level," *J. Biol Education*, Vol. 1, 1967, pp. 29-37
- "Inter-University Biology Teaching Project," *J. Biol. Education*, Vol 4, 1970, pp 197-203
- DUDLEY, B.A.C., "The Mathematical Basis of Population Genetics," *J. Biol. Education*, Vol. 7, 1973, pp. 41-43
- "The Mathematical Basis of Phenotypic Ratios," *J. Biol. Education*, Vol. 7, 1973, pp 25-28
- DRUGER, M., "An Approach to a Science Methods Course," *Science Education*, Vol. 53, 5, 1969, pp. 381-385
- EHRLER, E B., "The Preparation of Biology Teachers," *Bioscience*, Vol. 20, 1970 pp. 765
- ELWELL, F R., "Biology and Television," *J Biol Education*, Vol, 1, 1967, pp. 127-137
- EVANS, S.M. and D W Golding, "Nereis as an Experiment in Schools," Vol. 47, 1965, pp 161
- EVANS, S.M., "The Study of Bird Behaviour in Schools," *J. Biol Education*, Vol 2, 1968, pp 373-380
- FREELAND, P.W "A Photometric Method for Determining the Growth Rate of Yeast" *J Biol. Education*, Vol 5, 1971, pp 141-143
- "Assay of Vitamin C by Diffusion into Agarose Containing 2,6-Dichlorophenol Indophenol," *J. Biol. Education*, Vol. 6, 1972, pp. 183, 186.
- "GA Enhanced  $\alpha$ -Amylase Synthesis in Halved Grains of Barley A Simple Laboratory Demonstration," *J. Biol Education*, Vol, 6, 1972, pp. 369-375
- FORSYTH, H A., "Computers as an Aid to Teaching Nutrition," *J. Biol. Education*, Vol. 7, 3, 1973, pp. 31-36
- FRY, P J, "A Simple Cultural Technique for *Drosophila* sp," *Bull. Amer. Ent. Soc.*, Vol. 20, 1961, pp 250
- GALEN, D F. "Culturing and Using the *megaf eel*," *The American Biology Teacher*, Vol. 33, 1971, pp. 237-238
- GARATUN, T O. "Incorporation of Isotopes in Growing Cells of *E. Coli*," *J. Biol Education*, Vol. 4, 1970, pp. 97-103
- GIBBS, R K. "The Effectiveness of the BSCS Single Topic Films," *The American Biology Teacher*, 1962, Vol. 31, pp. 241-243

- GILLESPIE, A S., "Hatching Trout in the School Laboratory," *School Science Review*, Vol. 12, 1953, p. 96
- GOODHUI, D., "On Extending the Usefulness of Projections in Teaching Biology," *J. Biol. Education*, Vol. 9, 1, 1975, pp. 40-41
- GREENWOOD, M.I., "An Introduction to the Collection of Fleas of Small Mammals," *J. Biol. Education*, Vol. 7, 6, 1973, pp. 5-14
- GROHMAN, A.J.D., "The Biological Science Curriculum Study," *AIBS Bulletin*, Vol. 9,2, 1959, pp. 21-23
- "Need Five Experiments," *Science News*, Vol. 89, 1966, p. 166
- HALL, T S. and FLORENCE MOORE, *Life Science—A College Text Book of General Biology*, John Wiley, New York, 1955
- HANDL, P (ED.), *Biology and Future of the Man*, Oxford University Press, London, 1970
- HANSHU, M.H. "A Laboratory Practical on the House Building Behaviour of *Caddis Larvae*," *J. Biol. Education*, Vol. 7,3, 1973, pp. 3-7
- HARDIN, G., "A Path to Relevant Teaching," *Bioscience*, Vol. 20, 1970, pp. 488-490
- HARPER, G H., "The Three Dimensional Overhead Projector Transparency," *J. Biol. Education*, Vol. 8,6, 1974, pp. 343-349
- HINCHLIFF, J.R., "Figures on Animal Development," *J. Biol. Education*, Vol. 6, 1972, pp. 119-123
- "Observation of Early Cleavage in Animal Development: A Simple Technique for Obtaining the Eggs of *Rhabditia* (Nematode)," *J. Biol. Education*, Vol. 7, 6, 1973, pp. 33-37
- HORNSTY, D.J., "Radioactivity and the Biology Teacher," *J. Biol. Education*, Vol. 8, 6, 1974, pp. 313-322
- HURD, P.D., "The Controversy about Science Teaching," *AIBS Bulletin*, No. 5, 1959
- "The New Curriculum Movement in Science," *The Science Teacher*, Vol. 29, 1962, pp. 6-9
- "Teacher Preparation in Biology," *BSCS Newsletter*, Vol. 28, 1966, pp. 6-7
- "Inquiry Objectives for the Teaching of Biology in the 1970s," *Am. Biol. Teacher*, Vol. 32, 1970, pp. 553-554
- HUTCHINSON, S.A., "Purpose and Method in Biology Teaching—I: The Value of Biological Training," *The School Science Review*, Vol. 45, 1964a, pp. 356-363
- "Purpose and Method in Biology Teaching—II: The Organisation of Training," *The School Science Review*, Vol. 45, 1964b, pp. 534-541
- JAGIELLO, M., "The Blow Fly for Behavioural Studies," *Wards Bulletin*, Vol. 9, 1970, p. 6
- JANNINGS, A.I. "The Preparation of Graduate Biologists for Teaching," *J. Biol. Education*, Vol. 3, 1969, pp. 299-309
- JOHRI, B M., and MANOHARLAL, "Biology in Indian High School," *School Science*, 5,1, 1967, p. 31
- JONES, R.M. *Fantasy and Feeling in Education—An Answer to Burner*, New York Univ. Pub., New York, 1968
- KALMUS, H., "Biological Research in the Developing Countries," *J. Biol. Education*, Vol. 1, 1967, pp. 153-169
- KELLY, P J. "Trends in Biological Education—An International Review," *J. Biol. Education*, Vol. 1, 1967, pp. 1-12
- "Implications of Nuffield A-level Biology Series," *School Science Review*, Vol. 52, 1971, pp. 271-285
- and J D. WRAY, "The Educational Uses of Living Organisms," *J. Biol. Education*, Vol. 5, 1971, pp. 213-218
- "Evaluation Studies of the Nuffield A-level Biology Trials - 4, School Characteristics and Achievements," *J. Biol. Education*, Vol. 6, 1972, pp. 197-205

- "An Evaluation of the Nuffield O-level Biology Course Materials and Their Use—Part I," *The School Science Review*, Vol. 199, 1973a, p. 705
- "An Evaluation of the Nuffield O-level Biology Course Materials and Their Use Part II," *The School Science Review*, Vol. 199, 55, 1973b, p. 470
- KELSON, K.R., "From Innovation to Implementation Closing the Gap," *BSCS Newsletter*, Vol. 32, 1967, pp. 13-15
- KEMP, R.F.O., "The Linkage Clock - A Teaching Aid for Demonstrating the Segregation of Linked Genes," *J. Biol. Education*, Vol. 5, 1971, pp. 83-85
- KEMPERS, B., "The Use of 8-mm. Films in Teaching Biology," *Am. Biol. Teacher*, Vol. 32, 1970, pp. 170-172
- KENNEDY, M.H., "BSCS Single Topic Films," *Am. Biol. Teacher*, Vol. 29, 1967, pp. 552-556
- KORAN, J.J. JR., "A System Model for Science Teacher Supervision," *Am. Biol. Teacher*, Vol. 33, 1971, pp. 38-42
- KRAMER, L.M.J., "Some Electrical and Mechanical Devices to Illustrate Biological Principles," *J. Biol. Education*, Vol. 5, 1971, pp. 251-263
- LECOQ, L., "Biology Teaching in Secondary Schools in France," *J. Biol. Education*, Vol. 3, 1969, pp. 37-44
- LENTON, G.M., "A Laboratory Exercise for Ecology Teaching," *J. Biol. Education*, Vol. 9, 1, 1975, pp. 13-16
- LOCKARD, J.D., "Science Curriculum Developments in Foreign Countries," *Science Teacher*, Vol. 39, 1970, pp. 22-25
- MONTEAN, J.J., "Inquiry-Oriented Teaching Models for Use in College Methods Classes," *Am. Biol. Teacher*, Vol. 32, 1970, pp. 287-289
- MULLENGER, L. and N.R. GILL., "*Vibrio Natriegens* . A Rapid Growing Microorganism Ideally Suited for Class Experiments," *J. Biol. Education*, Vol. 7, 1973, pp. 33-39
- NCERT, *Ten-year School Curriculum—Framework*, NCERT, New Delhi, 1975
- NEAL, K.R.C., "8-mm Cassette Films in the Teaching of Biology," *J. Biol. Education*, Vol. 1, 1967, pp. 39-46
- NORRIS, S., "A Canadian Views British and American Secondary School Science," *Science Education*, Vol. 53, 1, 1969, pp. 34-42
- OECD REPORTS, *New Thinking in School Biology*, OECD, Paris, 1963
- PARRY WILLIAMS, J.R. and D.M. SERVANT, "Introductory Laboratory Exercises in Radiobiology," *J. Biol. Education*, Vol. 4, 1970, pp. 235-245
- PARRY WILLIAMS, J.R. and M. PULLAN, "On the Adaption of Indian Teachers to a Short Course on Nuffield Biology," *J. Biol. Education*, 1971
- PERROT, E., "The Education and Training of Biology Teachers," *J. Biol. Education*, Vol. 1, 1967, pp. 283-292
- PETERSON, G.E., "India and the Revolution in Biology," *Bioscience*, Vol. 1, 1964
- RAMSAY, H.P., "The Demonstration Laboratory-Teaching Aid in Biology," *J. Biol. Education*, Vol. 7, 1973, pp. 19-24
- REID, D.J. and P. Booth, "The Effect of Individual Learning upon the Future Demand for Science Teacher," *J. Biol. Education*, Vol. 4, 1970, pp. 187-195
- ROWE, A.J., "Machine Marking of Multiple-Choice Test . A Simple and Inexpensive System Using a Desk Top Calculator," *J. Biol. Education*, Vol. 6, 1972, pp. 13-16
- SCOTT, W.N., "Live Animals in School Teaching," *J. Biol. Education*, Vol. 1, 1967, pp. 319-323

- SHEPLEY, A.V. and B.A. COULIER, "A Field Study of Animal Behaviour," *J. Biol. Education*, Vol. 5, 1971, pp. 76-79
- SIMPSON, G.G. and W.S. BICK, *Life: An Introduction to Biology*, Harcourt Bruce & World, New York, 1957
- STANCE, D.E., "Implication for Teacher Preparation in the Effective Use of Teaching Aids for New Curriculum Materials," *BSCS Newsletter*, Vol. 32, 1967, pp. 23-24
- TAMIR, P. "An Alternative Approach to the Construction of Multiple-Choice Test-Items," *J. Biol. Education*, Vol. 5, 1971, pp. 305-307
- THOMAS, K.W., "The Merits of Continuous Assessment and Formal Examination in Practical Work," *J. Biol. Education*, Vol. 6, 1972, pp. 311-318
- TUCKER, F.P., "The Anti-Evolutionists of 1964," *Science Education*, Vol. 51, 1967, p. 371
- VARIY, M.T., "Continuous Assessment and Examining by the Open University," *J. Biol. Education*, Vol. 6, 1972, pp. 304-307
- VOGEL, I.H., "Slime Molds for BSCS Lab Exercises," *Am. Biol. Teaching*, Vol. 31, 1969, pp. 29-32
- WHITAKER, A. and J.D. WALKER, "Simulated Batch Production of Penicillin," *J. Biol. Education*, Vol. 7, 4 1973, pp. 37-42
- WHITTEN, A.J., "A New Behavioural Method for Further Determination of Olfaction in Mullard, (*Anas platyrhynchos*)," *J. Biol. Education*, Vol. 5, 1971, pp. 291-294
- WILSON, C., "A Study of Alpha-Glucosidase," *J. Biol. Education*, Vol. 1, pp. 1967, pp. 337-343
- WILSON, M.D., "Programmed Learning in Biology," *The School Science Review*, Vol. 49, 1969, pp. 682-695
- PARRY WILLIAMS, J.R. and R. BANASS, "Changing Attitudes towards Biological Education in Indian Schools and the Role of the All India Indo-British Summer Institutes," *J. Biol. Education*, Vol. 7, 1973, pp. 19-22
- WONG, H.K., "Programming a High School Biology Course," *Am. Biol. Teacher*, Vol. 26, 3, 1964, pp. 169-172
- WOODFORD, F.P., "Experiences in Teaching Scientific Writing in the U.S.A., *J. Biol. Education*, Vol. 6, pp. 9-12
- WOOLEVER, J.D., "Marine Laboratory for High School Biology," *The Science Teacher*, Dec., 1963
- WYATT, H.V., "Running, Jumping and Standing Still Game," *J. Biol. Education*, Vol. 1, 1967, pp. 239-242
- , "Examining Examined," *J. Biol. Education*, Vol. 7, 4, 1973, pp. 11-17
- , "Further Experiments with Digestive Enzymes in Freshly Killed Animals," *J. Biol. Education*, Vol. 8, 6, 1974, pp. 330-332. □

# Simplified Protoplast Isolation Techniques

## For Secondary School Biology Courses

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INVESTIGATIONS which employ isolated plant protoplasts have lately become very popular in cell physiological research. However, the techniques for their isolation have been varied, often too complex and above the level of high school students. Simple techniques for their isolation have been standardized for a variety of plant materials and step-wise instructions have been provided on the basis of which simple experiments can easily be carried out by the secondary school students. The scope for investigational projects by the students on the basis of these techniques has been emphasized.

### INTRODUCTION

Attempts in the direction of isolation of protoplasts from green plants were pioneered by Prof. E.C. Cocking of Nottingham, U.K., at the start of the last decade. Prior to these studies, the isolation of bacterial and fungal protoplasts had been achieved. After successes in isolation and purification works, by the

end of the last decade, researches began in the direction of regeneration of wall (Pojnar, Willison and Cocking, 1967 ; Mishra and Colvin, 1968, 1969), fusion and further differentiation (see Cocking, 1965, 1972 for detailed review) Somatic hybridization, employing protoplast techniques, was reported by the early part of the current decade (Carlson, Smith and Dearing, 1972) and the field became a favourite line of cell biologists almost throughout the world. Important ramifications of the researches on protoplasts included studies in the area of nuclear division (Rajasekhar, 1973), uptake of foreign organisms and macromolecules (Davey and Cocking, 1972) and introduction of cell organelles into fungal protoplasts (Vasil and Giles, 1975) and the possibilities of symbiotic association of nitrogen fixing bacteria with cereals and other crop plants (Davey, Cocking, and Eileen Bush, 1973 ; Carlson and Chaleff, 1974).

The picture presented above, though brief and incomplete, clearly shows the recent emergence of this branch of cell physiology and the future potentialities of studies on the above mentioned lines with their bearing upon fundamental biological principles and bio-engineering of crops and other plants. The time is thus ripe for the inclusion of these developments in the late secondary and early college curriculum. But when it comes to such early inclusion of important biological developments, the most serious problem is confronted due to the lack of suitable laboratory exercises to support the theoretical components, particularly in the developing countries.

The researches on protoplasts also, like many other areas, have employed experimental techniques which often stipulate more difficult laboratory condi-

tions than within the reach of the most of the schools. For protoplast isolation, complex enzyme mixtures of two or more components such as cellulose, pectinase, and other commercial preparations are often reported to be used in research papers under "difficult conditions" in terms of buffering (Power, Cummings and Cocking, 1970) and use of glass columns for isolation (Gregory and Cocking, 1965), which too are beyond the reach of the students and teachers.

The objectives of the present study are to (i) simplify and standardize techniques for protoplast-isolation in order to bring them to the secondary school levels, (ii) to suggest simple experiments using the isolated plant protoplasts and, (iii) to stimulate the students and teachers to think further and plan their own investigational projects in terms of convenience in the involved methodology vis-a-vis the scientific frontiers of cell physiology.

#### MATERIALS AND METHODS

The simplified procedure involved the use of only the following laboratory items.

1. Petridishes,
2. Glass rods, mounted needles, scalpel and forceps,
3. Conical funnel, clean cotton wool and filter paper,
4. Beakers and Erlenmeyer flasks,
5. Microslides, cover slips and ordinary laboratory microscope,
6. Sodium nitrate,
7. Pectinase.

The plant materials on which the simplified procedure (described under results) have been tried successfully were as follows

1. Young cauliflower leaves and midribs,



2. Leaves and midribs of tender leaves of the cabbage-head enclosing the growing point,
3. Petioles of pumpkin leaves,
4. Placenta of tomato and bell pepper,
5. Pieces from the inner layer of the fruit-wall of tomato and bell pepper, and
6. Young developing leaves and shoot apices of guava.

## RESULTS

### (i) *Simplification of the Enzyme Mixture*

For the cell-types mentioned above, a variety of combinations of enzyme mixtures for weakening the wall were substituted by a simple solution of pectinase whose concentration was brought down from the earlier 20 per cent (w/v) to the lowest of 5 per cent for very tender tissues. But generally a concentration 10

per cent was found to be optimally suitable. Pectinase being an expensive chemical a drastic reduction in the cost was thus made feasible.

The incubation medium, generally 20 per cent sucrose with added  $Mg^{++}$  and  $Ca^{++}$  buffered at PH 7.2 was substituted with a simple 0.25M sodium nitrate solution in distilled water. Incidentally, sodium nitrate was used by Power *et al* (1970) but not as the enzyme carrier, but as a reaction 'terminator' and a medium for the release of protoplasts from cells.

No other equipment, centrifuges, or glass collared columns (Gregory and Cocking, 1965) were employed in these studies. Even the use of pH meter was rendered unnecessary.

### (ii) *Standardized Procedures*

With the above mentioned modifications the steps in protoplast isolation are given stepwise as the following

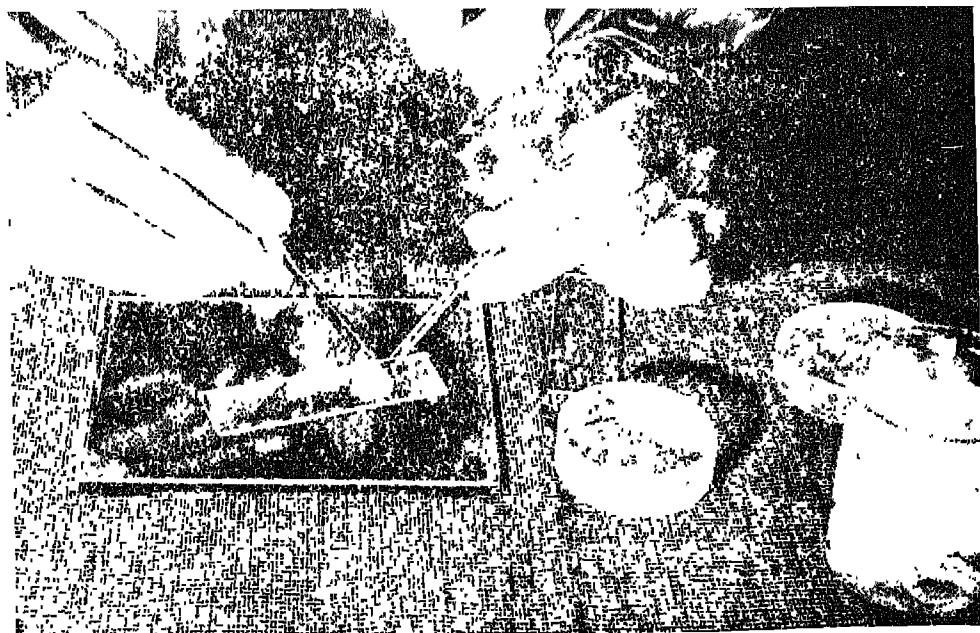


FIG. 1 The material is chopped into thin pieces.

1. The cell-types or tissues to be used were first gently washed with a mild detergent and kept in distilled water before the next step
2. The material was chopped into 1-2 mm thick sections by means of a scalpel (Fig. 1).
3. The sections were transferred to a petridish and kept submerged in a 5-10 per cent pectinase solution (dissolved in 0.25M sodium nitrate, previously allowed to settle and then filtered through Whatman No. 1 filter paper) and allowed to incubate at the room temperature (20-25°C) for 1-1½ hour.
4. After incubation the enzyme mixture was decanted off, (Fig. 2) sections washed once or twice with plain 0.25M NaNO<sub>3</sub> without pectinase and then beaten with a glass rod into a fine homogeneous paste (Fig. 3).
5. More sodium nitrate solution was added to the macerated cells and the entire thing filtered through a thick layer of cotton wool (Fig. 4). The filtrate was collected in a conical flask and allowed to stand for 10-15 minutes.
6. A drop of the settled material was taken out by means of a dropper and examined on a glass slide under the high power of a microscope (Fig. 5)

was used for washing and mounting also.

It was often desired to observe the protoplasts for longer periods for wall regeneration, division, fusion or differentiation into callus. For such studies the sodium nitrate solution was supplemented with salts contained in the Hoagland's solution for plant water-culture in half the strength but without the micronutrients and an added component of 1 ppm Kinetin. It must be mentioned here that even with such care as mentioned above, workable sterility could not be maintained generally beyond 4-6 days.

#### (iv) *Observations with the Protoplasts*

Simple observations on plasmolysis, deplasmolysis, bursting, etc. could be performed on these protoplasts and may be tried by students using mannitol, sucrose, dilution with distilled water, etc. Resistance to bursting by dilution with added water on the grooved slide at different time intervals could be studied giving the time course picture of the wall regeneration. If the students could succeed in maintaining reasonable sterility of cultures (a skill to be acquired through experience and expert guidance), they can also observe division, stages of fusion, and differentiation into callus. Thus opportunities for conducting the students' investigational projects using plant protoplasts remain unlimited for the high school students with inclination towards cell biology.

#### (iii) *Working under Sterile Conditions*

In case it was desired to work under relatively sterile conditions, all the laboratory items mentioned above were heated at 95-100°C before use. At no stage the tissue slices were touched with hands. Pectinase was dissolved in previously autoclaved sodium nitrate solution which

#### DISCUSSION AND CONCLUSION

Through these studies on simplification and standardization of techniques of isolation of protoplasts, a new area for inclusion of such topics in the theoretical and laboratory courses, inducing recent

PLATE I

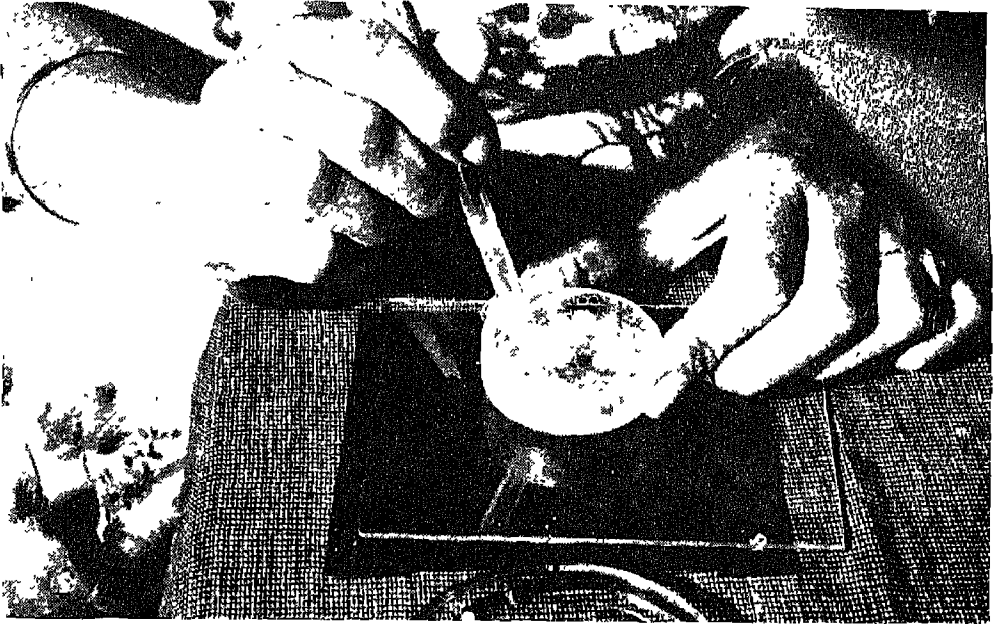


FIG 2 After incubation in the enzyme solution the excess is decanted off



FIG 3 A glassrod is used to macerate the pieces into a homogeneous paste.

PLATE II



FIG. 4 The homogenate is filtered through a thick layer of cotton wool.

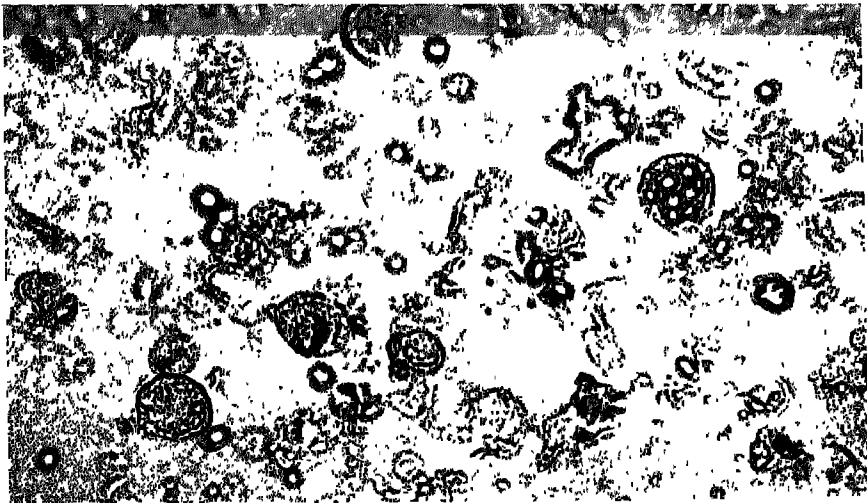
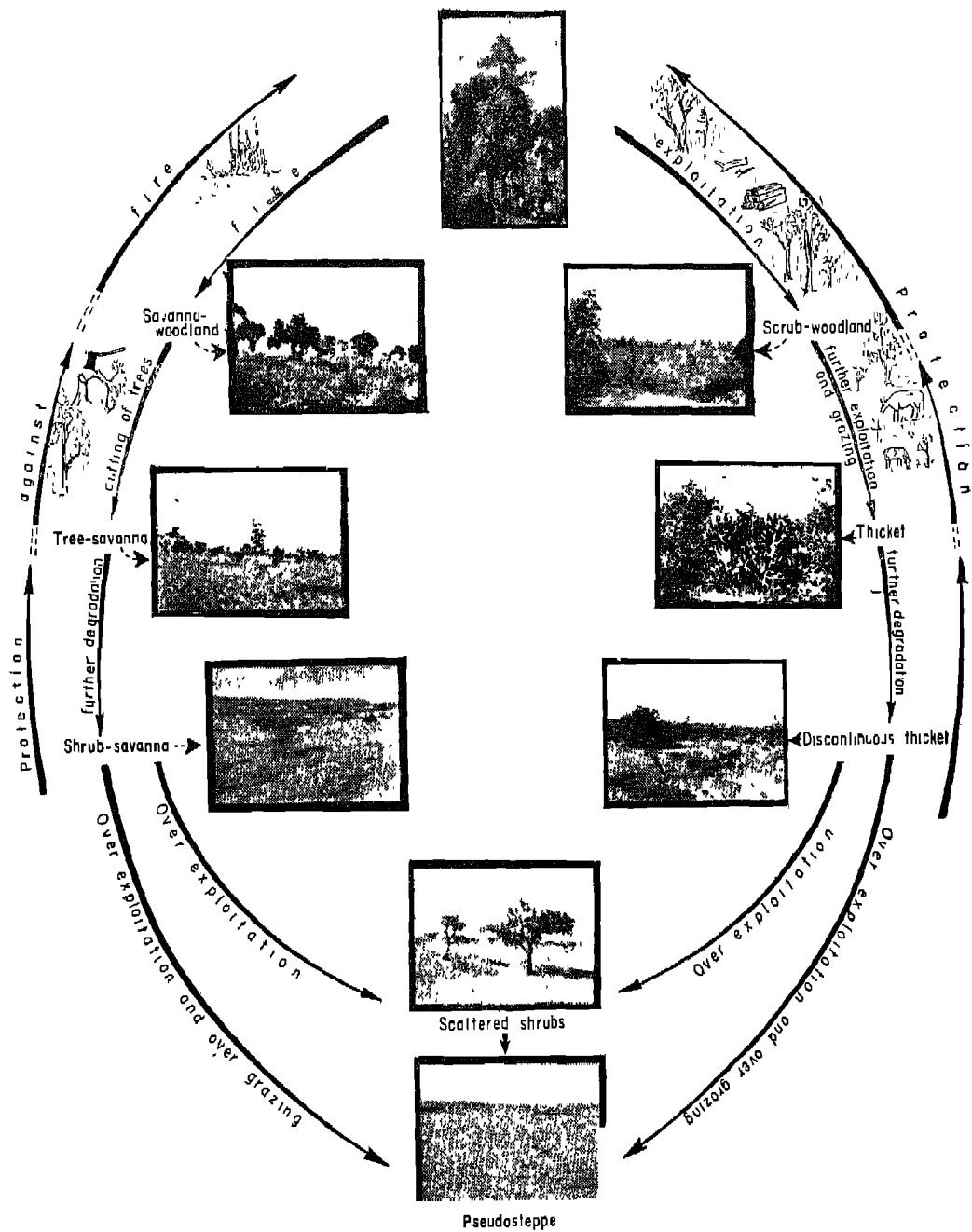


FIG. 5 A general view of freshly isolated protoplasts.

PLATE III  
DECIDUOUS FOREST



# PLATE IV

## Fluctuations in the total and seasonal rainfall and rainy days at RANCHI

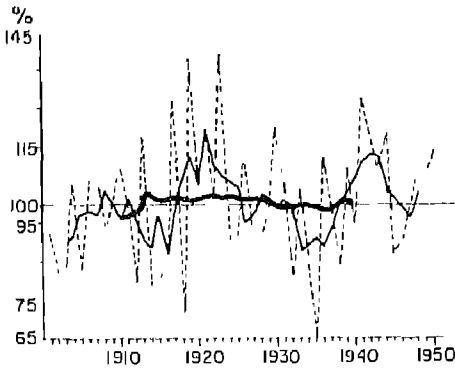


Fig 3a Total rainfall

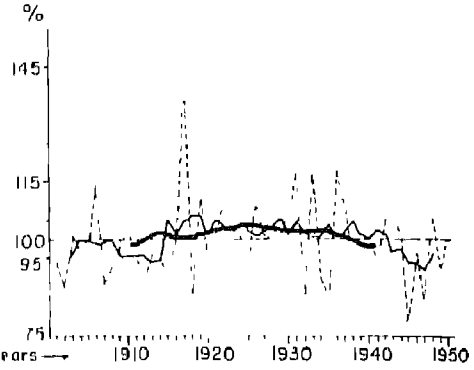


Fig 3b Total no of rainy days

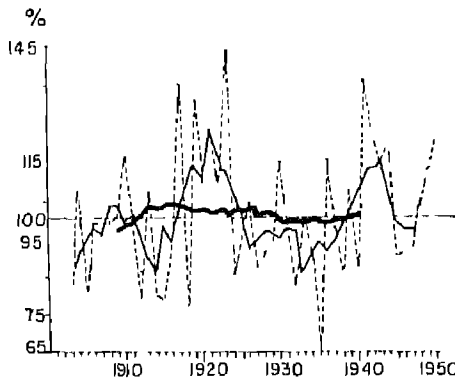


Fig 3c Rainfall for the period May-Oct

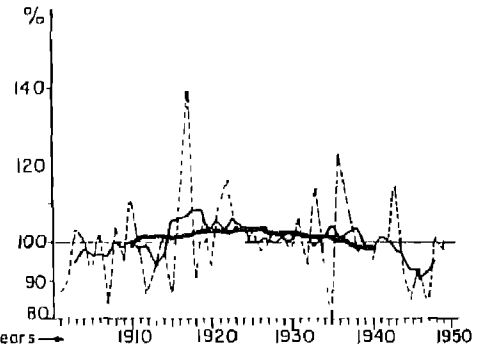


Fig 3d No of rainy days for the period May-Oct

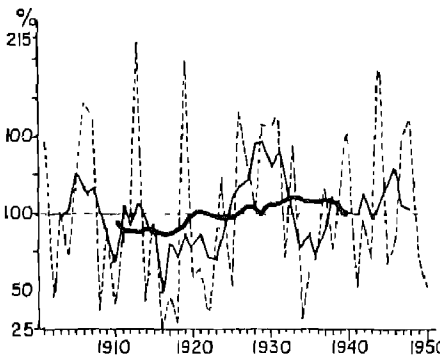


Fig 3e Rainfall for the period Nov-Apr

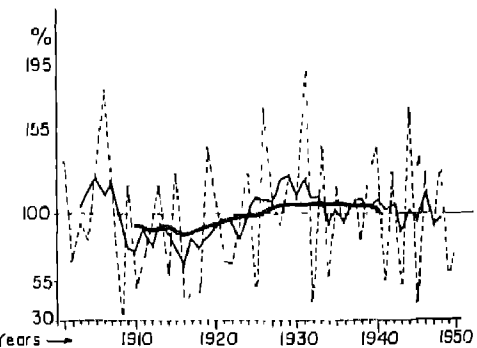


Fig 3f No of rainy days for the period Nov-Apr

----- YEARLY      ——— 5-YEAR RUNNING MEANS CENTRED ON YEAR GIVEN      ——— 20-YEAR RUNNING MEANS CENTRED ON YEAR GIVEN

ideas about protoplasts and their potentialities, have been made possible. The simplified techniques can now enthuse the young students to probe further into this exciting, modern and potentially important area of biology with certain basic implications on the elucidation of biological principles and bio-engineering aspects of symbiosis, parasitism, gene inclusions and somatic hybridization

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#### REFERENCES

- CARLSON, P.S. and CHALEFF, R.S., "Forced Association between Higher Plant and Bacterial Cells in Vitro," *Nature*, 252, 1974, 393-394
- SMITH, H.S. and DEARING, R.D., "Parasexual Interspecific Plant Hybridization," *Proceedings of National Academy of Sciences, U.S.A.*, 69, 1972, 2292-2294
- COCKING, E.C., "Plant Protoplasts" (fungi, gymnospermae, angiospermae)," *View Points in Biology*, 4, 170-203, Butterworth Inc., Washington, D.C., 1965
- , "Plant Cell Protoplasts—Isolation and Development," *Annual Review of Plant Physiology*, 23, 1972, 29-50
- DAVEY, M.R. and COCKING, E.C., "Uptake of Bacteria by Isolated Higher Plant Protoplasts," *Nature*, 239, 1972, 455-456
- , and EILEEN-BUSH, "Isolation of Legume Root Nodule Protoplasts," *Nature*, 244, 1973, 460-461
- GREGORY, D.W. and COCKING, E.C., "The Large-Scale Isolation of Protoplasts from Immature Tomato Fruits," *Journal of Cell Biology*, 24, 1965, 143-146
- MISHRA, A.K. and COLVIN, J.R., "Structure of Wall-like Envelopes on Isolated Tomato-Fruit Protoplasts," *Proceedings of Canadian Federation of Biological Societies, 11th Annual meeting*, Kingston, Ontario, Canada, pp. 68-69, 1968
- , "The Formation of Well-like Envelopes by Isolated Tomato Fruit Protoplasts," *Protoplasma*, 67, 1969, 295-305
- POJNAR, E., WILLISON, H.M. and COCKING, E.C., "Cell Wall Regeneration by Isolated Tomato Fruit Protoplasts," *Protoplasma*, 64, 1967, 460-480
- POWER, J.B., CUMMINGS, S.E. and COCKING, E.C., "Fusion of Isolated Plant Protoplasts," *Nature*, 225, 1970, 1016-1018
- RAJASEKHAR, E.W., "Nuclear Division in Protoplasts Isolated from Pollen Tetrads of *Datura Metel*," *Nature*, 246, 1973, 223-224
- VASIL, I.K. and GILES, "Induced Transfer of Higher Plant Protoplasts into Fungal Protoplasts," *Science*, 180, 1975, 680



# Role of Anthropogenic Factors on the Vegetation of India

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*Whereas pollution is the main degrading factor of the environment around the urbanized centres in recent years, the natural vegetation has come under the pressure of human influence since centuries past. Some aspects of man's impact on the plant-cover and transformation of the landscapes have been reviewed. While man cannot be held responsible for bringing about a change in the regional or general climate, his interference with vegetation affects the eco-climate.*

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MAN's influence on the vegetation, may be considered from four aspects .

- transformation of the natural landscapes into agricultural, pastoral, industrial and urbanized types; disturbed natural vegetation, clearing of forest for agriculture, dependence on forests for other needs as timber, fuel wood and miscellaneous forest products, fodder



- for cattle;
- destruction of indigenous species through such transformation. Even the silvicultural practices tend to favour a few economic species at the expense of many others,
- introduction and spread of exotic species;
- diverse anthropogenic activities directly affecting plants (example. pollution) or indirectly, through modification of the eco-climate

Not only is our country densely populated (547 million people . 1971 census), with decennial (1961-71) growth rate of 24.6 per cent but has been peopled continuously since the ancient times. The evidences of human occupation date back to palaeolithic period.

#### *Exterior relations*

India had relations with the countries beyond its border since the time immemorial; these extended both in the west and in the east.

Commercial relations of India may go back to the days of Harappan civilization. Blurred tracks in existence during the palaeolithic period were developed into trade routes about 2500 B.C. (*Cf 5000 Years of Indian Trade*). Mohenjo-daro and Harappa were connected by riverine transport and carried on trade with Mesopotamia, Turkey, Greece and Egypt, both through land and sea routes. Indian trade in 1000 B.C. during the reign of King Solomon included armour, peacocks and precious stones.

It was the conquest of Alexander that opened a way into the heart of Asia. By then export articles from India to Mesopotamia and Europe included metals

like gold, silver, copper, brass and copper ware, pearls, precious stones, lapis lazuli, ivory and plant products like different woods, cotton cloth, muslins, oils, dyes, aromatics, resinous gums, sugarcane juice, pepper, cinnamon and other spices

By the 1st century A.D., Indian ships were sailing seas south and east of India and sea-borne trade was active along Coromandel—Circar coast. Roman colonies were founded in South India during the 1st and 2nd centuries A.D. The Indian influence in the South-East Asia was at its height at the time of the Buddha and persisted up to the 5th and 6th centuries A.D.

In course of time, the commercial activity speeded up. In the 11th century, Indian sugar from Malwa was exported to other countries from Gujarat ports and rubies, pearls, aromatics and grasses were being carried to Syria and Rome from Malabar. Marco Polo in 1292 reported on pearl fishing in Coromandel, import of horses in Tirunelveli, export of ginger, pepper and indigo from Quilon, incense, leather and cotton from Thana, and hides from Cambay.

There were also invasions from the west, notably in A.D. 712, A.D. 1018 and A.D. 1202. In 1498, was discovered the sea route to India by Vasco de Gama. The subsequent centuries saw the establishment of the Portuguese, Dutch, British and French settlements in different parts of the country. The phenomenal increase in trade may be emphasized by one example. The East India Company exported 250,000 lbs. of pepper in 1620, also 50,000 pieces of calico, and 200,000 lbs. of indigo from Patna, among other items.

These historical events, however, were not without repercussions on the vegetation: destruction, introduction and inter-

exchange of species, creation of botanical gardens, rapid dispersal of economic exotics and the accompanying weeds

The history of introduction of some of our common weeds like *Croton bonplandianum*, *Eupatorium odoratum*, *Lantana*, *Opuntia*, *Parthenium hysterophorus*, *Prosopis juliflora*, *Scaevola taccada* and *Ulex europaeus* is by now well known but even the sandal wood tree, *Santalum album*, appears to be a result of earlier introduction from the East (Fischer, 1927). The genus *Santalum* comprises 15 species in north and south-east Australia, New Guinea and a number of pacific Islands. *S. album* has a disjunct distribution in Indonesia and India. As commercial and cultural relations are known between these countries since the 1st century A.D., there is a possibility of the species having been introduced into India by the traders who originally used to import its wood. Viart (1963) lays emphasis on the fact that there is no evidence in the ancient texts to show that the species was indigenous to India. Besides, the very behaviour of *S. album* in India is that of a typical exotic. It has a tendency to establish itself gregariously in a region as it did in Karnataka and Tamil Nadu.

Unfortunately, it is attacked by the *Spike* disease, probably of a virus origin, which is spreading over almost the entire population of the species. On the other hand, the species is extending spontaneously in Poona and Chanda (Maharashtra), near Jeypore (Orissa) and in Vishakhapatnam district where it was introduced about 50 years ago.

*Acacia planifrons* likewise appears to be a result of accidental introduction from Arabia and East Africa in Tirunelveli district and in Porbandar area of Kathiawar (Viart, 1963; Meher-Homji, 1970a).

### Degradation of Forest

In Kerala, the potential vegetation is a dense evergreen forest. With the interference of man it becomes less dense and assumes the characteristics of a semi-evergreen forest with mixture of evergreen and deciduous species. Further activities of man changes it into a moist deciduous forest, which occurs as the potential vegetation in regions lying further north in Karnataka, with a longer dry season.

The deciduous forests of Peninsular India, now in the process of degradation, present two kinds of physiognomies: (i) savanna type and (ii) thicket type. In the former, fire is an important factor in maintaining the growth of tall grasses. In a savanna woodland, the density of trees is high, whereas in a tree-savanna it is less. When all the trees are destroyed and only shrubs are left with grasses, the formation is called shrubby-savanna. The trees are either pyrophytic in nature, resisting fire with special bark adaptations or they are protected on account of their edible fruits and seeds (*Embellica officinalis*, *Buchanania lanzan*, for example). In the thicket type all the grasses and palatable species are overgrazed. Due to the dearth of inflammable material, the risk of fire is minimized. Spiny or thorny and unpalatable shrubs and stragglers dominate in the thicket formation.

Overgrazing reduces tall grasslands into "pseudosteppes" with short grasses. *Aristida* spp., *Eragrostis* spp., *Heteropogon contortus* are the usual denizens of the pseudosteppes. Plate III depicts the degradation stages of the deciduous forest.

Thickets may be dense or discontinuous, tall or low, with some emergent trees (scrub-woodland) or not. Disconti-

nous thicket with more and more openings ultimately takes the shape of "scattered shrubs". Species of cactiform *Euphorbia* are common in such landscape of scattered shrubs. Different species are encountered in different regions varying in climate, geology and soils (Meher-Honji, 1964)

The various forest types of India and their degradation stages are mapped by Gaussen *et al.* (1961, 1970, 1973)

In an extensively cultivated region like Pondicherry, almost all the traces of natural vegetation are obliterated. It is only on the most unfertile soils like the red sandy loam (ferrallitic or ferruginous) that the relict natural vegetation is encountered in a degraded stage. It is not that only such soils of low fertility are suitable to this remnant piece of vegetation, but it has the only chance to survive on these soils not yet put under plough.

#### *Man's Impact on Vegetation and Landscape*

The forest area of India covers about 22 per cent of the total area while the optimum is considered as 33 per cent at the rate of 60 per cent in the hills and 20 per cent in the plains. Even the 22 per cent area does not represent "forest" in the true sense of the term; in the dry regions the so-called "reserved forests" are nothing but degraded thickets subject to illicit exploitation and grazing.

Man's action on the vegetation has been mostly on the destructive side through the agency of axe, fire and the domesticated animals. Even when his action is protective like the silvicultural treatments, only a few economic species like teak (*Tectona grandis*), rosewood (*Dalbergia latifolia*) and Sal (*Shorea*

*robusta*) are favoured at the expense of many others. Thus most of the forests worked under the forest-management are no longer near their original state.

Besides, man maintains certain forests in a degraded stage in view of economical working. This is the case of the evergreen forests of Burma where teak would disappear if the forest were permitted to grow very dense. The very object of the silvicultural management is to favour the regeneration and improve the growth of commercial species in reducing to the minimum the competition from the species having no marketable value.

Man is the most important factor responsible for bringing about the destruction of natural vegetation. In Central India, prior to 1862, there was no system of forest management and the forests were exploited unchecked. With the introduction of the Wasteland Management Rules, cutting of economic trees like *Tectona grandis*, *Terminalia tomentosa*, *Dalbergia paniculata*, *Pterocarpus marsupium* was declared illegal in 1862, except on permits.

In some districts like Durg (Madhya Pradesh) there was no restriction on felling of trees till 1880. However, illegal felling continues. Besides, the forests are burdened with certain rights as in some areas agriculturists are entitled to certain concessions and privileges. These include removal of timber of non-prohibited species up to 1m girth, dry bamboo, bark, fruits and leaves.

Heavy overfellings were carried out during World War II. Besides, the neglect of cultural operations during this period affected the regeneration of important species.

In the Kalahandi district (Orissa), in 1948, the right of cutting the teaks in their own holdings was granted. Since

then, the bulk of good teak in this district has disappeared.

Centuries of unrestrained exploitation has greatly altered the microclimate at several places. Such changes in the microclimate over relatively short distances have contributed substantially to changes in the community structure. Subsequent protection of certain forest tracts has led to the preponderance of economic species like teak. According to Bhatia (1959), continued exploitation on the one hand, and protection afforded to the forest on the other, do not permit the forest to advance to the climax in the teak forest. In our opinion, the exploitation and protection remove the natural character of the forest in as much as the proportions of the species are disturbed. Exploitation changes the physiognomy, but not the floristic composition, to the extent of rendering the present-day forests far removed from the climax.

Intensive phase of destruction of forest in India started towards the end of the 18th and beginning of the 19th centuries. Tea and coffee plantations were introduced on a large-scale in the Western Ghats, Sri Lanka and Darjeeling. Systematic exploitation of the timbers, notably teak, started about the same time. For instance, in 1799, 10,000 teak were cut in Malabar for the Government of Sri Lanka.

The network of railways was intensified after 1857. Each rail track of 80 kms. required 20,000 tonnes of wood, almost exclusively of teak in the southern states and sal in the north and east. The density of the network may give an idea of the requirement of the wood by the railways.

In the "sleeper operation", carried out between 1890 and 1920, lakhs of sleepers were supplied to the Bengal-

Nagpur Railway from the Sambalpur district (Orissa). Almost all the available sound sal trees down to 35 cm diameter were exploited. Only a control check placed in 1924 enabled the forests to recover.

Large scale export of timber to Nagpur and other places (from the Balaghat and neighbouring districts) commenced after the construction of the Satpura Railways in 1903-04. The two world wars necessitated overfelling and, prior to the abolition of the proprietary rights, all the utilizable trees were exploited, thus deteriorating the forests that were even free from shifting cultivation.

*Overgrazing* is another factor for degradation of the vegetation and soil. In almost every part of India except the hilly regions, the density of cattle is in excess of the fodder available.

The carpet of grass that springs up in the rainy season is in no time browsed to the ground level thus creating a problem of soil erosion. The decreased shoot cover and root growth expose the soil to erosive forces such as the beating effect of toriential monsoon rainfall and cutting effect of run-off water.

The grazing problem is in a way paradoxical. Whereas the accessible areas are overgrazed, hardly leaving any grass-cover, at least some remote areas remain almost free from grazing and get covered with coarse grasses which interfere with the regeneration of forest species and became a cause of devastating fires in the hot season.

The cattle owned by the villages near the forests graze in the forest itself. The intensity of grazing may be light or heavy causing damage in the following ways.

- (1) the soil gets hardened by treading and affects drainage;

- (2) the changed soil conditions affect the growth of trees, especially teak which becomes stunted,
- (3) seedlings are trampled down and saplings broken;
- (4) sheep and goats browse on the tender shoots and young leaves of all species and graziers lop branches to provide fodder

In Rajasthan, *Prosopis cineraria* is extensively lopped. In parts of Madhya Pradesh and Maharashtra, the fodder of *Hardwickia binata*, a tree of the deciduous forest, is chiefly responsible for feeding the cattle in the dry years. As a matter of fact, grazing and human interference seem to explain the disjunct and patchy distribution of *Hardwickia* in peninsular India (Meher-Homji, 1970 a). The species has a wide ecological amplitude: the annual rainfall range is 500 to 1200 mm, spread over 4 to 6 months, it is encountered on gneissic rock, sandstone, quartz and the Deccan Trap; on the shallow gravelly soils and on deep black clayey soils as well. In many of the open forests and tree savannas, the seedlings are conspicuous by their absence. There are indications of reproduction having been killed by browsing, or badly hacked by the graziers.

The destructive role of repeated fires is well known. The most sensitive species are gradually eliminated, whereas the others that are less sensitive or fire-resistant can maintain themselves and multiply. Most of the species of the dense wet evergreen forest fall in the former class. Normally the fire does not run through this type of forest because the underwood is thin and the grasses absent. The problem arises only when such a forest has been opened. If the new growth is burnt, the regeneration may be

seriously affected. Species less sensitive to fires abound in the deciduous forests and their degradation stages (Vart, 1963). These are not easily inflammable because their thick bark plays an important protective role against the diffusion of heat and protects the living cells of the wood. Examples of such pyrophytic species are *Bombax ceiba*, *Boswellia serrata*, *Cleistanthus collinus*, *Cochlospermum religiosum*, *Emblica officinalis*, *Garuga pinnata*, *Hardwickia binata*, the dwarf palm *Phoenix humilis*, and *Rhododendron nilagiricum* (of the montane savannas of the South Indian hills). Some species have a remarkable capacity of recovering after fires, thanks to the aerial or subterranean sprouting. *Careya arborea*, *Diospyros melanoxylon*, *Emblica officinalis*, *Lagerstroemia parviflora*, *pterocarpus marsupium* and *Woodfordia fruticosa* have such adaptation. The bamboos resist flames through their rhizomes.

In some cases fire escapes from the areas burnt for shifting cultivation and spreads to the neighbouring forests in the absence of fire lines. The tribals often set fires to the forests for collection of *mahua* (*Madhuca indica*) flowers and for inducing new grass growth for grazing purposes.

Fires are harmful to the sal, the species does not grow beyond the stage of whippy coppice due to annual fires. In the savannas, with repeated fires, the trees become crooked, hollow and unsound. Regeneration of many species is checked due to the annually recurring fires.

Fire also accentuates the effect of drought, for example, that of 1967-1968 in the Sambalpur and Bolangir districts of Orissa, and is responsible for the mortality in the sal trees having girth of less than 75 cms.

Fires cause considerable damage especially in summer by burning the seedlings and saplings and damaging the trees. Teak becomes unsound with repeated fires. Some fire-affected trees become susceptible to frost and borer attack. Some of the fires are quite devastating. For instance in the Bhandara district (Maharashtra) in the year 1950-51, 80, 463 acres of forest area was burnt down.

*Butea monosperma* and *Ziziphus xylopyrus* being low crowned, get damaged by fires. Consequently, the lac insects, of which these two species are hosts, are not able to thrive in such fire affected areas.

The practice of *shifting cultivation* has also led to progressive deterioration of forests. This pernicious practice was in vogue till the recent past in the hilly areas and it is still prevalent in certain districts of Madhya Pradesh (Kanker, Raipur) and Orissa (Kalahandi, Baudh Khondmal). A plot is clearfelled in the forest during the dry season through fire. With the first rains are sown millets, the hill variety of paddy or turmeric (*Curcuma longa*). Two or three harvests are obtained in the successive rainy seasons. Then as the fertility of the soil is reduced the plot is abandoned to be covered in time by forest regrowth. The cultivator then destroys another piece of forest. The duration of fallow depends on the vigour of the new growth and the surface available to carry out the practice.

Shifting cultivation carried out in the past destroyed forests on a large scale. In the Balaghat district alone hundreds of square kilometres of forest areas were affected, leaving malformed, crooked and unsound trees. The unsoundness in sal in certain areas is attributed to the shifting cultivation and fires which have disturbed the drainage and aeration of the soil.

### *Transformation of the Landscape*

Agriculture is the fundamental cause of the transformation of the natural landscape, but agriculture apart, man has favoured and propagated other non-edible useful species by raising them in plantations.

(1) *Plantations*. In the forest plantations mostly the indigenous species are used among which the pride of place goes to teak (*Tectona grandis*). In the humid zone *Bombax ceiba* too is planted. In the drier regions the following are used for the production of fuel wood and soil conservation.

<i>Alanthus excelsa</i>	<i>Casuarina equisetifolia</i>
<i>Albizia lebbek</i>	<i>Dalbergia sissoo</i>
<i>Azadirachta indica</i>	<i>Pongamia pinnata</i>
<i>Cassia siamea</i>	<i>Tamarindus indica</i>

At 2000 m altitude near Darjeeling there are plantations of *Cryptomeria japonica*. Its wood is used as packing cases for tea. Towards 2500 m certain conifers have been tried. *Pinus patula*, *P. thumbergii*, *Thuja plicata*, *Larix leptolepis*, *Picea sitchensis*, *Cupressus funebris* have given interesting results.

In the Punjab the successful plantations between 2400 m and 2800 m comprise *Larix decidua*, *L. leptolepis*, *Populus generosa*, *P. alba*.

Several species of *Eucalyptus* are used in plantations throughout India. *E. globulus* was introduced in the Nilgiris in 1843. In 1910 other species followed: *E. pilularis*, *E. eugenoides*, *E. paniculata*, *E. creba*, *E. acmenoides*. In 1866 *Eucalyptus* spp. were tried in Lucknow, *E. camaldulensis*, *E. tereticornis* and *E. citriodora* gave good results in the plains and *E. globulus* in the Siwalik. *Eucalyptus tereticornis* is extensively planted in the plains.

*Acacia mearnsii*, *A. dealbata* and *A. decurrens* were planted as ornamental trees on the South Indian hills about the middle of the 19th century. The bark yields tanning material. *Acacia moniliformis* is gaining importance in Bihar.

Other species planted on the South Indian hills are *Alnus nepalensis*, *Pinus khasya*, *P. radiata*, *P. taeda* and *P. caribaea*.

Plantations of *Cinchona succirubra* on the western slopes of the Nilgiris deserve a mention. Those of tea, coffee and *Hevea* have been carried out at the expense of humid forests. *Hevea brasiliensis* is planted between 500 and 1200 m altitude. The species was first introduced in Nilambur (Kerala) in 1879 but large plantations date from 1904. Coffee plantations are found between 1200 and 1500 m in South India. Coffee was first introduced in the Bababudan hill of Mysore State in the 17th century by a Muslim pilgrim returning from Mecca but plantations began in 1830. They were almost totally abandoned in Sri Lanka following the invasion of *Hemileia vastatrix* in 1860. The Indian plantation was not spared by the epidemic. It was partly reconstituted with *Coffea robusta* which is less susceptible than *C. arabica*. Tea plantations occupy areas above 1500 m altitude in Sri Lanka and India. Shade is an important factor in plantations. Besides the native species like *Erythrina lithosperma*, *Gliricidia maculata*, *Albizia chinensis*, *A. lebbek*, *A. odora* *tissima*, the Australian *Grevillea robusta* too is largely used.

*Anacardium occidentale*, probably of Brazilian origin, was introduced in the 16th century by the Portuguese on the west coast of India. The species is hardy and can grow on poor soils. Its plantations occupy over 4000 ha in Kerala and

16,000 ha in Chingleput and S. Arcot districts of Tamil Nadu.

*Casuarina equisetifolia* is planted on the coastal sands as well as in the interior regions like Bangalore at an altitude of 900 m. Its rapid growth even on poor soils makes it a valuable fuel wood species.

*Cocos nucifera* may have reached the shores of India by natural means but its area has been largely expanded by man even in the dry zones. Another palm, *Borassus flabellifer*, is also an important element of the cultivated landscape in low sub-humid regions not far from the sea where it regenerates naturally. Its uses are known to man since time immemorial. As many as 801 uses are enumerated in Tamil literature (Willis, 1955). It is difficult to judge whether the species is natural to India as it is never seen in the forest.

(2) AVENUE TREES: King Asoka (300 B.C.) recommended plantations of trees along the roads and canals in the whole Empire. Akbar also proposed similar measures in the 16th century A.D.

The species presently used as avenue trees are (1) *Tamarindus indicus*, (2) *Syzygium cumini*, (3) *Mangifera indica*, (4) *Madhuca indica*, (5) *Samanea saman*, (6) *Albizia lebbek*, (7) *Azadirachta indica*, (8) *Ficus bengalensis*, (9) *F. religiosa*, (10) *F. glomerata* and other species of *Ficus*. Many of these yield edible fruits like (1, 2, 3, 10). Flowers of *Madhuca indica* are used for distillation of an alcohol, *Samanea saman* and *Albizia lebbek* are decorative trees and *Ficus bengalensis* provides good shade.

In the Gangetic valley, *Dalbergia sissoo* is extensively planted along the roadside. It yields timber of good value. The presence of *Populus nigra* in the Kashmir valley poses the question of its origin—whether it is exotic or indigenous.

Puri (1945) reported a few leaf impressions definitely agreeing with the leaves of this poplar and concluded that it was common in the forests of the valley towards the end of the second interglacial time-span of the pleistocene era. Fotidai (1961) points out the polymorphism of the leaves of this species (FAO, 1958) and the absence of female trees in Kashmir and thus questions the indigenous nature of the species. It is therefore probably introduced like other species of the genus *Populus deltoides*, *P. alba*, *P. tremula*. Poplars and *Platanus* are conspicuous in Srinagar valley, in harmony with the mediterranean character of its climate (Legris, 1963).

#### *Man's Impact on Regional Climate*

Man is often blamed for deteriorating the climate. Even the creation of desert conditions in Rajasthan-Sind are attributed to his thoughtless actions, in the relatively recent past (Raverty, 1892, Bryson and Baerreis, 1967). The Indus Valley Civilization thrived in the north-west part of the Indian subcontinent more than 4,000 years ago, but the causes of its decline cannot be linked to the onset of aridity alone. Historical reviews (Vishnu-Mittre, 1974, Meher-Homji, 1973) rule out the possibility of the medieval origin of the desert. The floods and shifts in the river courses appear to have had their share in changing the ecology of the area through time. The role of man in degrading the local conditions in a dry region by abusive land-use has to be recognized, but the desiccation of the area is in all probability linked to the meteorological phenomenon and circulation pattern affecting climatic events in other parts of the

world as well, and man need not be blamed for the desertification of the Thar. In spite of indications of scrub-burning and cultivation during the period 3000 B.C. to 1000 B.C., corresponding to the great expansion of the neolithic-chalcolithic cultures, Singh *et al.* (1974) noted an increase in the plant-cover (as registered in the pollen sequence of the Rajasthan lakes).

Oscillations in the climate of western Rajasthan have been pointed out (Table I) by several workers, amongst them Verstappen (1970), Singh (1971), Goudie *et al.* (1973) and Singh *et al.* (1974). While Wadia (1955) linked the onset of aridity in the Indian Desert with the northward retreat of glaciers, Verstappen (1970) and Goudie *et al.* (1973) present evidence in favour of an association between glaciations in the northern latitudes and desiccation in the subtropics.

Vishnu-Mittre (1974) suggests no major climatic shifts during the last 10,000 years. Meher-Homji (1971, 1973, 1974) has brought out the strong inter-yearly variability in the rainfall amount and distribution in the north-west part of the subcontinent which does not render the average values meaningful. Periodically, quite heavy falls have been recorded, the nearest example being the monsoon of 1973 in the Sind and in the arid Rajasthan. In 1959, Karachi with an annual average of 200 mm, received 224 mm just in 5 days in late June-early July and Sonmiani (E. Baluchistan) experienced 308 mm between 30th June and 4th July. Some workers have postulated stability in the dry climate of Rajasthan even through earlier geological time (Axelrod, 1950, 1964; Meyerhoff, 1970). The development of desert in Arabia and in the Near East is placed during the Late



TABLE 1  
CHRONOLOGICAL SEQUENCE OF ARIDITY AND HUMIDITY IN RAJASTHAN

Time		Geomorphological or palaeopalynological evidence	Aridity-humidity scale	Reference
Pre-Middle Age	Stone	Major dune formation (No human activity)	Major dry phase	Goudie <i>et al.</i> (1973)
(Cold)cene	Early Halo-	Huge sand "shields" deposited to the windward of the hills	Pronounced aridity	Verstappen (1970)
Middle Stone Age		Phase of deep weathering. Through flowing Luni River with coarse debris load (Human occupation at Pushkai and elsewhere)	Humid phase	Goudie <i>et al.</i> (1973)
Upper (Pre-8,000 B.C.)	Palaeolithic	Dunes cover lake basins, (Absence of human activity except at margins)	Severe dry phase	Goudie <i>et al.</i> (1973) Singh <i>et al.</i> (1974)
C 8,000 B.C. to 7,500 B.C.		Pollen sequence from the Rajasthan lakes indicates	a moist phase with 250 mm more rain than now.	Singh <i>et al.</i> (1974)
C. 7,500 B.C.		Indication of vegetation burning by man. Probable beginning of cultivation with Cerealia-type of pollen.		" "
C 7500 B.C. to C 3000 B.C. (Per-Harappan phase)		Plant-cover comparatively poor.	A drier phase but not so dry as at present	" "
C. 3000 B.C. to C. 2000 B.C. (Harappan phase)		Vegetation of grassy steppe-savannah type, not a close-canopied forest.	A moist phase, Average annual rainfall 500 mm higher than now.	" "
		Obstacle dunes deeply dissected. Parabolic dunes developed from the sands washed away from sand shields.	Rainy phase	Verstappen (1970)
		Archaeological evidence.		Goudie <i>et al.</i> (1973)
C. 2000 B.C.		Lunkaransar lake in W Rajasthan starts drying up.	Onset of aridity in the present-day arid belt.	Singh <i>et al.</i> (1974)
C. 1800 B.C. to C. 1400 B.C.		Sambhar lake begins to turn saline. Freshwater species disappear, halophytes show some increase.	Aridity spreads eastwards.	" "
C. 1400 B.C. to C. 1000 B.C.		A temporary change towards fresh water conditions.	Slight amelioration in climate.	" "

<i>Time</i>	<i>Geomorphological or Palaeopalynological Evidence</i>	<i>Aridity-Humidity Scale</i>	<i>Reference</i>
Ca 1000 B.C.	Sambhar lake begins to dry up.	<i>Difference of about 1,000 years for the expansion of arid conditions from Lunarkansar lake located in the east to Sambhar lake lying further west</i>	Singh <i>et al.</i> (1974)
Early centuries to present	Lunarkansar lake in the present day arid belt	had already attained the degree of aridity prevailing there now, perhaps conditions were better marginally.	" "
	Formation of Barchan dunes indicate	<i>increase in dryness in W. Rajasthan.</i>	Verstappen (1970)
	The pollen sequence in the Pushkar lake suggests	<i>the end of arid period in the Aravallis around A.D. 400</i>	Singh <i>et al.</i> (1974)

Tertiary by Legris (1963) and Raven (1972).

As for the statement of Ramaswamy (1968, 1972) that the monsoon rain was higher in the Harappan period, it is based on a simple assumption that the monsoonic depressions which were very feeble in W. Pakistan during the period 1891-1960, were abundant in the remote past curving towards E Iran, Afghanistan and the Thar. The vast reserve of subterranean water near Bikaner and Lathi, in the opinion of Ramaswamy, is the result of infiltration of rain into the soil over a period of 6,000 years, from 6,500 B.C. to 500 B.C., the recharging of the aquifers being virtually improbable under the present climate. In connection with the age

of fossil, the ground water in Saudi Arabia is believed to be 20,000 years old, C. Vout (Cf. Rubin, 1963) makes a pertinent remark about contamination which may interfere with the exact dating

In conclusion, it may be said that the rainfall may have fluctuated (though not substantially in terms of length of rainy season) during the protohistoric and historic periods and even earlier, the general dryness seems to have persisted since a very long time to have permitted the evolution of plants and animals typical or endemic of the arid zone. The following evidence supports the pervallence of a dry climate during the protohistoric period.

In the Mundigak archaeological site of Afghanistan, charcoal remains of

*Salvadora persica* twigs and *Ziziphus vulgaris* seed-shells have been reported by Porteres (Cf. Casal, 1961) in the periods III, I and II, 3b respectively, the radio-carbon dates of which are  $1036 \pm 220$  B.C. and  $1521 \pm 230$  B.C. These plants even now grow naturally in Baluchistan.

Ashfaq and Naqvi (1973) make mention of the use of gypsum in the masonry structure of the Great Bath at Mohenjodaro. The gypsum must have come locally and should imply a dry climate.

The Harappans preferred the sea-route round the Kutch peninsula to enter Lothal in Kathiawar from the Sind, rather than the land route across the Thar desert (Rao, 1973).

Vishnu-Mittre (1974) has reviewed the palaeo-palynological work done in Rajasthan. We would like to add that in the pollen spectrum of Lunkaransar lake, in the zone LK-3 (Cf. Singh *et al*, 1974), the simultaneous occurrence of the fossil pollen of the characteristic arid zone species like *Calligonum*, *Prosopis cineraria*, and a mesophytic genus *Syzygium* is surprising. *Syzygium cumini* is now planted in the desertic areas like Jodhpur and Jaisalmer, but occurs naturally in areas receiving more than 850mm. *Calligonum*, on the other hand, seldom exceeds the limit of 400 mm.

Leshnik (1973) opines that neither the implements of agriculture nor the external climatic conditions have changed significantly over the last 4,000 years in the Sind-Rajasthan region. The Harappan agriculture was dependent upon artificial irrigation.

Another instance of deterioration in climate following deforestation is reported for the Ranchi plateau by Warren (1974). Analysing the climatic data of the periods 1864 to 1919 and 1920 to 1943, Warren (*l.c.*) opined that the climate has become

drier in the hot weather and the pre-monsoon period during 1920-1940 following extensive cutting down of forests. According to his statistics, the months March-to-June register a decline in rainfall and rainy days during 1920-1943 compared to the prior period, whereas the rainy season months July-to-September show an increase in rainfall. As March-to-May are statistically dry months, we find it difficult to agree completely with Warren's view that deforestation has substantially affected the rainfall pattern of Ranchi.

We have approached the problem of variability at Ranchi in a different manner by analysing the fluctuations in the total and seasonal (May-October, November-April) rainfall and number of rainy days for the period 1901-1950 using the data published by the Indian Meteorological Department (1965). The rainfall and rainy days data is scrutinized in three stages: (1) actual yearly variability, (2) 5-years and (3) 20-year-running means.

The inter-yearly variations in the total seasonal rainfall and rainy days are brought out in Plate IV. These are particularly marked for the November-April period (Figs. 3e-3f); the rainfall range extends from only 25 per cent of the average November-April rainfall in the year 1916 to 212 per cent of the average in 1913; The number of rainy days show the range of 33 per cent (1908) to 192 per cent (1931).

For the total rainfall, three consecutive below average years are 1901-1903, 1914-1916, 1927-1929, 1945-1947. the most deficient year is 1935 with rainfall only 67 per cent of the average total; 1918 recorded 72 per cent of the mean (Fig. 3a). For the total number of rainy days, the percentage deficit is not so pronounced as for the total rainfall amount. The years 1918 and 1935 had 86 per cent

rainy days compared to the average (Fig. 3b).

The 5-year running means curve smoothens the yearly fluctuations and brings out the spells of years above or below the average. The notable below average spells in the total rainfall on the basis of the 5-year moving means are the years 1903-1907, 1912-1916, 1932-1937, whereas 1917-25, 1938-1946 are noteworthy above average spells (Fig. 3a). From the point of view of the total rainy days, 1909-1914 and 1943-1948 are below average according to the 5-year moving averages, while the spell 1915 to 1942 shows values ranging from 100 per cent to 106 per cent on the excess side (Fig. 3b).

The 5-year running means curves of rainfalls and rainy days of the period May-October show quite some parallels with those of the total rainfall and total rainy days in that they bring out nearly the same notable spells of below and above average years (Table 2). Those of the period November-April show some differences.

The 20-year running means curve has the advantage of showing the trend towards increasing or decreasing precipitation (Winstanley, 1973). This curve for the total rainfall shows a slight increase from 1913 (mean of 1904-1923) which continues till 1940 (mean of 1931-1950) (Fig. 3a). The 20-year moving means curve for the total rainy days shows a very slight decline towards 1939, 1940, after having reached the maximum of 104 per cent in 1926 (Fig. 3b).

For the period May-October, the 20-year moving average of rainfall shows a very slight declining trend from about 1930 (central year), to reach an average value in 1939-40 (Fig. 3c). For the rainy days, the values centred on 1937 to 1940 show a 1 per cent decline after registering

a rise above the mean value from 1910 (Fig. 3d).

The 20-year curves of rainfall and rainy days of the period November-April (Figs 3e, 3f), show an increasing tendency from 1927 onwards after initial decline.

In conclusion, though the 20-year moving means curves show an increasing trend in rainfall and rainy days of the November-April period, and a slight decreasing tendency in the total and May-October period rainy days, the inter-yearly fluctuations of rather important magnitude reduce the importance of the trends.

### *Concluding Remarks*

It may be admitted that whereas man cannot significantly influence the general macro-climate whatsoever be the extent of the destruction of the natural vegetation (as the former depends on the planetary dynamics), he can bring about profound modification of the eco-climate.

For example, in the Palni hills, under the forest, the absolute minimum temperature never descends below 0°C, whereas in the degraded areas presenting the physiognomy of savannas, the nocturnal temperature may be as low as -9°C in winter. The relative humidity during dry spells of 30 to 60 days shows similar contrasts: nearly 30 per cent in the savannas but not so low in the forests (Legis and Blasco, 1969). Such low humidity easily allows the fires to pass through the grassy formation and accounts for the wide extent of the savannas on the South Indian hills according to these authors. We would like to emphasize here that the potential maximum vegetation of these areas is a montane forest but it is in a very delicate balance with the climate.

TABLE 2  
NOTABLE SPELLS OF BELOW AND ABOVE AVERAGE YEARS AT RANCHI  
DURING THE PERIOD 1901-1950 ACCORDING TO THE 5-YEAR AND  
20-YEAR RUNNING MEANS

<i>Total or Seasonal Rainfall or No. of Rainy Days</i>	<i>5-year Running Means</i>		<i>20-year Running Means</i>	
	<i>Notable Below Average Spells</i>	<i>Notable Above Average Spells</i>	<i>Notable Below Average Spells</i>	<i>Notable above Average spells</i>
Total rainfall	1903-1907 1912-1916 1932-1937	1917-1925 1938-1946	1910-1912	Slight increase from 1913
Total number of rainy days	1909-1914 1943-1948	1915-1942	1910-1911 1939-1940	1912-1938
Rainfall of the period May to October	1903-1907 1912-1916 1926-1938 1945-1947	1917-1925 1939-1944	1910-1911 1930-1938	1912-1929
No. of rainy days for the period May - October	1903-1914 1943-1948	1915-1932 1934-1939	1937-1940	Rise from 1910 till 1936
Rainfall of the period November to April	1914-1924 1933-1937	1904-1908 1925-1932 1944-1948	From commen- cement to 1920, 1923-1926	From 1927 onwards
No of rainy days for the period November-April	1908-1923	1903-1907 1924-1933 1937-1942	From commence- ment to 1925	From 1927 onwards.

Once the forest is cleared by man, the regeneration of its tree species in the open areas is rendered very difficult because of frost and drought. In short, the climax vegetation is in harmony with the average climate; only when it is disturbed that the fluctuations in the climate become important in determining the secondary vegetation which is affected more by biotic factor than climatic. Whereas the montane forest is composed of the species of tropical stock, the woody elements of the shrub-savanna are of sub-tropical, temperate or Himalayan

stock: their seedlings are able to tolerate the extreme conditions prevailing in the open areas (Meher-Homji, 1967)

In the humid regions of plains or low elevation, the consequences of deforestation are not much felt. The savannas are maintained essentially by the fires as frost does not occur in these lowlands. The return of the degraded vegetation to the forest stage is possible on protection.

Under drier climate, deforestation has far-reaching consequence on the eco-climate and soil. Erosion, increased temperature and deficit of saturation

create fresh local conditions, no longer conducive to the reorganization of the original vegetation. A substituted type arises in place of the potential vegetation, lower in status to the latter. Legris (1963) is of the opinion that the *Acacia-Capparis decidua* type of vegetation of the Deccan is in fact a substitute type resulting from a dry deciduous miscellaneous forest originally containing *Hardwickia binata*, *Anogeissus latifolia* and probably even

teak. The *Albizia amara* type of Salem and Coimbatore districts of Tamil Nadu is likewise a probable substitution of dry deciduous teak forest.

The degradation of the forests by human agency on the Aravalli hills (Rajasthan), which are mainly comprised of Indian and Indo-Malayan species, leads to their invasion by desertic species of the Thar and Africa, Arabia (Meher-Homji, 1970 b).

#### REFERENCES

- ASHAQUE, S.M. and S.A. NAQVI, Mohenjodaro Modern metropolitan of antiquity *Unesco Courier* Dec. 1973 : 9-13, 38.
- AXELROD, D.I., Evolution of Desert vegetation. *Publ. Carnegie Inst, Washington* 590 : 215-306
- Reply to W. Hamilton (discussion on paper by D.I. Axelrod, *J. Geophys. Res.* 69(8) 1669-1671.
- BHATTIA, K.K., Teak bearing forests of old Madhya Pradesh. *Indian For.* 85 : 710-722
- BRYSON, R.A. and D.A. BARRIS, Possibilities of major climatic modification and their implications: North-West India, a case for study. *Bull. Am. Met. Soc.* 48(3) : 136-142
- CASAL, J.M., Fouilles de Mundigak. *Mém. de la délégation archéologique Française en Afghanistan* t 17, Vol. 1, 260 p. Lib. Kincksieck, Paris.
- FAO, Poplars in forestry and land-use. *FAO Forestry and forest products studies* No. 12.
- FILLIOZAT, J., Les relations extérieures de l'Inde. *Inst. Fr. Pondichery. Indologie*, 2 : 1-60.
- FISCHER, C.E.C., *Santalum album* in India *Kew Bull.* 5 : 200-202.
- FOTIDAR, A.N., Exotics in Kashmir. *Tenth Silvicultural Conf.* 2 : 684-690.
- GAUSSIN, H.P. LEGRIS, M. VIARI, V.M. MEHER-HOMJI, K.A. SHANKARNARAYAN, M.V. DAMHOLKAR, R.K. GUPTA, International map of vegetation and environmental conditions. Sheet Cape Comorin. ICAR, New Delhi, *Inst. fr. Pondichery. Trav. Sect. Sci. Tech.* Hors Série No. 1.
- GAUSSIN, H., V.M. MEHER-HOMJI, P. LEGRIS, F. BLASCO, J.P. TROY, R.K. GUPTA, A. DELACOURT, International map of vegetation and environmental conditions Sheet Rajasthan. *Ibid.* Hors Série No. 17
- GAUSSEN, H., V.M. MEHER-HOMJI, P. LEGRIS, A. DELACOURT, J. FONTANEL, J.P. TROY, International map of vegetation and environmental conditions. Sheet Orissa. *Ibid.* Hors Série No. 19
- GOUDIE, A.S., B. ALLCORN and K.T.M. HEGDE, The former extensions of the Great Indian Sand Desert. *Geogr. J.* 139 (2) : 243-257

INDIA METEOROLOGICAL, DEPARTMENT, Monthly and annual rainfall and number of rainy days Period 1901-1950, Pt. I.

LEGRIS, P. "La végétation de l'Inde Ecologie et flore," *Inst Fr Pondichery, Trav Sect Sci Tech*, 6:1-589, 1963

— and F BLASCO Variabilité des facteurs du climat cas des montagnes du Sud de l'Inde et de Ceylan *Ibid* 8(1). 1-95, 1969

LESHNIK L S, "Land Use and Ecological Factors in Prehistoric North-West India," In *South Asian Archaeology* (Ed ) N Hammond, Duckworth, London, 1963

MEHER-HOMJI, V M. "A Parallel in the Habit and Habitat of the Cactiform Euphorbias of India," *J Biol. Sci.* 7(2) : 64-67, 1964

—Phytogeography of the South India Hill Stations," *Bull Torrey Bot Club*, 94 : 230-242, 1967

—Notes on Some Peculiar Cases of Phytogeographic Distributions," *J Bombay nat Hist. Soc*, 67(1) 81-86, 1970a

—Some Phytogeographic Aspects of Rajasthan, India," *Vegetatio*, 21 : 299-321, 1970b

—"Bioclimatic Variability with Special Reference to India," *Trop. Ecol.* 12(2) : 155-176, 1971

—Is the Sind-Rajasthan Desert the Result of a Recent Climatic Change?" *Geoforum* 15 : 47-57, 1973

—Variability and the Concept of a Probable Climatic Year in Bioclimatology with Reference to the Indian Sub-continent," *Arch Met. Geoph. Biokl*, Ser B, 22 : 149-167, 1974

MEYERHOFF, A A., "Continental Drift : Implications of Palaeomagnetic Studies, Meteorology, Physical Oceanography and Climatology," *J Geol.* 78(1) 1-51, 1970

PURI, G.S., "Lombardy Poplar (*Populus nigra* Linn. var., *fastigata*) in India," *Indian For.*, 71 : 423-425, 1945

RAMASWAMY, C, "Monsoon over the Indus Valley during the Harappa Period," *Nature*, 217 628-629, 1968

—Ground Water Reserve under the Thar Desert," *Int Hydrological Decade Newsletter*, 17: 1-2, 1972

RAO, R.S., *Lothal and the Indus Valley Civilization*, Asia Publ. House, New Delhi, 1973

RAVEN, P.H., "Plant Species Disjunctions A Summary," *Ann Missouri Bot Gdn* 59 : 234-246, 1972

RAVERTY, H G., "The Mhuran of Sind and Its Tributaries—A Geographical and Historical Study," *J Asiat. Soc Bengal*, 61 : 155-158, 1892

RUBIN, M, "Simultaneity of Glacial and Pluvial Episodes from C-14 Chronology of the Wisconsin Glaciation," In *Changes of Climate*, Arid Zone Res, Unesco, 223-228, 1963

SINGH, G., "The Indus Valley Culture Seen in the Context of Postglacial Climatic and Ecological Studies in Northwest India," *Archaeol. Physical Anthropol. Oceania*, 6 : 177-189, 1971

SINGH, G., R.D JOSHI, S K CHOPRA and A B SINGH, "Late Quaternary History of Vegetation and Climate of the Rajasthan Desert, India," *Phil Trans. Roy Soc. London*, B 267(889) : 467-501, 1974

VERSTAPPEN, H TH., "Acolian Geomorphology of the Thar Desert and Palaeo-Climates," *Zeitschrift für Geomorphol*, Supplementband 10 : 104-120, 1970

VIART M., "Contribution a l'étude de l'action de l'homme sur la végétation dans le Sud de l'Inde, These, Univ. Toulouse, 1963

VISHNU-MITRI "Plant Remains and Climate from the Late Harappan and Other Chalcolithic Cultures of India—A Study in Inter-relationships," *Geophytology* 1974 (in press)

WADIA, D.N., Deserts of Asia—Their Origin and Growth in the Late Pleistocene Time, Second Sir Albert Charles Seward Memorial Lecture, Bhubal Sahni, Inst of Palaeobot., Lucknow, 1955

WARRIN, W.D.M., "A Study of Climate and Forests in the Ranchi Plateau," Pt. II, *Indian For.* 100(5) 291-314, 1974

WHITT, J.C., *A Dictionary of Following Plants and Ferns*, Cambridge, 1955

WINSTANLEY, D., "Rainfall Patterns and General Atmospheric Circulation," *Nature*, 245, 190-194, 1973





# The Use of Fish in the Teaching of Biology at the School level

## A Preliminary Survey

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BIOLOGY is that branch of science which deals with the discourse of life. Surprisingly, for a long time in the teaching of biology, dead animals and plants were used to study the life processes. For this reason biology has often been ironically referred to as "necrology", the study of corpses.

In our country, only recently efforts have been made to introduce various living organisms at the school level. It is expected that while learning, the pupil will observe and explore different forms of living things and their functional structure, instead of merely studying the morphology of a few dead animals and plants.

In the new 10+2 curriculum, where science is compulsory up to 16 years of age, it is desired that our future generation must have a better understanding of the animate and inanimate nature of their surroundings. Towards this effect, in the new biology curriculum, at all levels, more emphasis has been laid on the study of plants and animals in relation to their natural surroundings. It is expected that the students will get more opportunities to observe and investigate the variation, diversity, and interrelationship amongst the organisms, their life processes and the effects of different biotic and abiotic factors on them (Kelly, 1975).

This means that the schools will have to collect and maintain a large number of living organisms. This will require some expertise which the school must possess. It is essential to know the living organisms available in the locality, how to procure them and maintain, what are their nutritional requirements, how learning experience can be provided with these organisms and what are the safety measures? Answers to these queries can be provided only after proper survey of the various institutions and by judging the needs of the teacher.

The efforts to assist teacher in the use of living organisms are in progress all over the world (Kelly & Wray 1975). In this department, a project has been undertaken along similar lines (NCERT, 1976). The present paper is the result of a pilot survey under it. The main purpose of this survey was to see how teachers respond towards this project and whether significant results could be obtained to develop an instructional material on the use of living organisms.

Of the various living organisms, which can be used in biology teaching, fish was chosen in this pilot project for the following reasons.

- (a) Fishes are available all over the country and are cheaper than frogs, birds and rats.
- (b) Fishes are more easily accepted socially than frogs or lizards.
- (c) It is comparatively easy to maintain fishes in the school premises.
- (d) Comparatively more people (specially from coastal area) have some experience in the maintenance of fish.
- (e) Live fishes may be used for a wider variety of experiments.
- (f) Most fishes can be handled safely.

### *Material and Methods*

In order to survey the existing status of the use of fish in schools a questionnaire was prepared according to the expert opinions in the field. The questionnaire was sent to one hundred schools (80 secondary and 20 middle schools) all over the country. For this purpose the schools were selected from four regions north, south, east and west. Each region received about 20 questionnaires. The particulars about the schools selected and the return of the questionnaires are given in Tables 1 and 2.

### *Observations*

*Middle Schools.* All the middle schools were coeducational and 45 per cent questions were returned after completion. All the school teachers were very enthusiastic to use fish in the biology classes, because fishes are easily available and easy to maintain and can be effectively used in teaching locomotion, respiration, growth and nutrition. Morphological and anatomical studies can also be carried out with the help of fish. Some of the teachers (25 per cent) thought that the concept of interdependence of plants and animals can also be explained easily by using an aquarium.

Rohu, catla, mrigal, bhетки, mullet and barbs were reported as the commonly available fishes. The schools were also asked about the available facilities for maintaining an aquarium. Majority of them (77 per cent) had all the necessary equipment, only a few did not have some of the items.

Most of the schools reported that the students have the basic knowledge of fish morphology and anatomy, and on an average, 30 per cent of the students were

found to be fish eaters (This information was thought necessary, because the fish-eating students might have the knowledge of its nutritional value and morphological characters).

*Secondary Schools.* Selected secondary schools were of mixed structure (Table 1). They include government institutions as well as private institutions, coeducational schools, as well as schools purely for girls and boys. A 43 per cent return was obtained (Table 2). Response was better in the case of private schools than that

from the government schools. Majority of the teachers were of the opinion that fish can be effectively used in biology classes. As indicated in Table 3, catla, rohu, mrigal, arabas, bola, hilsa, mullet and chela were the fishes mostly reported to occur widely. Tilapia, shark, saidine, clarias and singhola were also reported by some schools. The teachers did not hesitate when they had to handle fish in the classroom. Reasons given for preferring fish as a teaching aid are its availability, easy maintenance, familiarity and

TABLE 1  
SHOWING STRUCTURE OF THE SCHOOLS SELECTED

No. of Schools	Nature of Schools	A					B	
		Government Institution	Private Institutions	Coeducation Schools	Purely Boys' Schools	Purely Girls' Schools		
80	Secondary Schools	42	38	47	18	15		
20	Middle Schools	20	—	20	—	—		
100	Total	62	38	67	18	15		

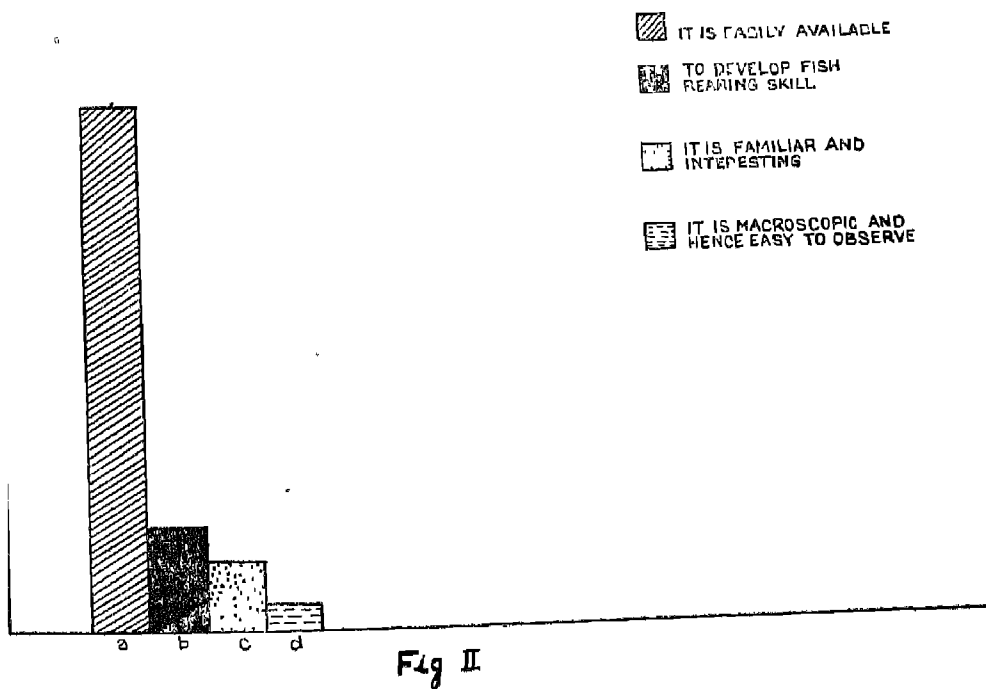
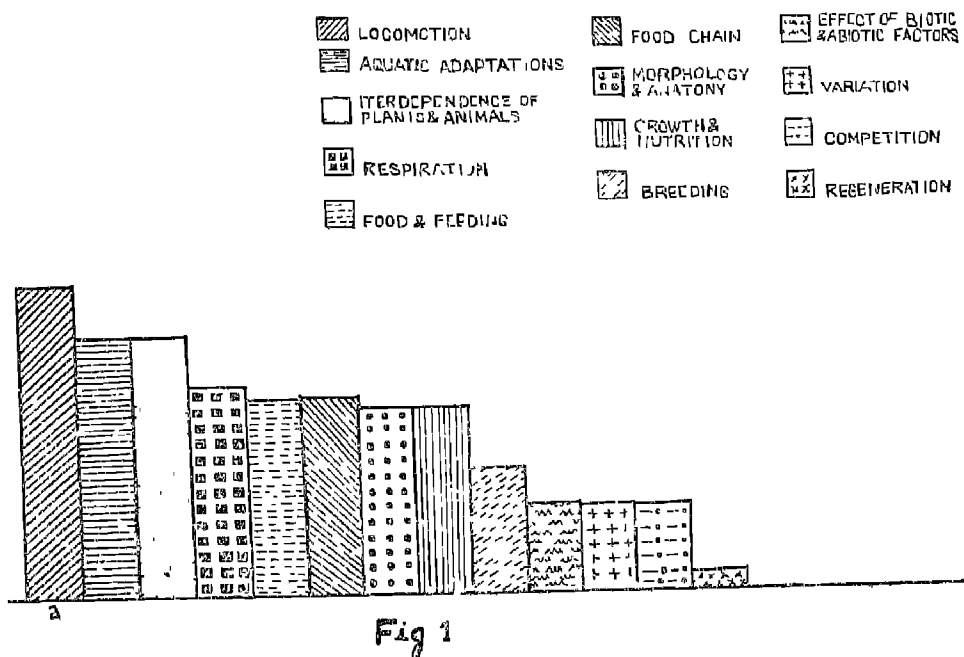
TABLE 2  
SHOWING THE NUMBER OF QUESTIONNAIRES DISPATCHED TO EACH  
REGION AND RESPONSES RECEIVED

Schools	Regions	No. of Questionnaires Dispatched	No. of Replies Received	Questionnaires Completed	
				Actual No.	%
Secondary 80	North	22	6	5	22%
	South	19	11	11	52%
	East	20	13	13	65%
	West	19	6	6	31%
Middle Schools 20	North	9	5	5	55%
	South	4	2	2	50%
	East	5	2	2	40%
	West	2	—	—	0%
Total	100	100			44%

TABLE 3  
SHOWING % OF SCHOOLS REPORTING VARIOUS FISHES OCCURRING IN THEIR REGION

## Types of Fishes

Percentage of Schools	Catta	Rohr	Mriga	Koi	Bola	Barb	Bhatki	Hilse	Pomfret	Mullet	Optio	Gela	Gomani	Singhala	Tila-	Seer
											Phallus				pia	fish
	87.0/	78 1.0/	68 1.0/	77.0/	77.0/	77.0/	25.0/	23.0/	20.0/	16.0/	16.0/	9.0/	9.0/	9.0/	9.0/	9.0/



moderate size (Fig. 1) Fig. 2 shows the various biological processes reported by the school teachers where they can use live fish. About 62 per cent schools reported that their students have the knowledge of external as well as internal morphology of a fish. The majority of the schools have the facilities to maintain an aquarium culture of fish. An average of 52 per cent students were found to be fish eaters.

### *Discussion*

The present survey clearly indicates that majority of the teachers are willing to cooperate with the project. Secondly, it is possible to get a fair picture of the existing status of a particular organism in the school condition. Thirdly, it creates enthusiasm in the teachers and draws their attention towards the use of a particular organism. It also shows that fishes are easily available in most of the places, and majority of the schools have the facilities to maintain them. The students have a basic knowledge of fish and they find fish watching very interesting. The teachers are capable of training the students in fish keeping and most of the fishes reported are edible.

All these points go in favour of the purpose of the research project. In the existing conditions, it is possible to suggest certain important learning experiences to the teachers using fish. For example, in the primary school, a fish aquarium will increase the power of observation in the children. It will also help to develop their aesthetic sense, when they will learn to arrange plants, shells and other decorative pieces in the aquarium. They will learn to admire and preserve all that is beautiful.

The use of live fish in classroom will

make the teacher's job easy and interesting. The students will learn from their own observations that the fast swimmers have a deeply forked caudal fin, whereas the slow swimmers, have truncated or wedge shaped caudal fin.

They may also learn that flapping of the gill-covers is very essential for respiration. The rate of flapping varies in different fishes and is related to their activity. They may learn several such simple phenomena which will provide a lot of fun that is so urgently required at this level. They may learn about the behaviour of various fishes in different seasons (Martin D. 1975 & Kuhn D. J. 1970). Developmental studies can also be carried out in schools (Banker, 1972).

Fishes form an important source of proteins and vitamins. If the students acquire the skill of fish rearing and breeding, it will not only be in their own interest but also in the interest of the nation. Many states (Mysore, Assam and West Bengal) are starting fisheries training as one of the vocational courses. If these are successfully carried out the students can find employment for themselves.

### *Conclusion*

Similar investigations on other animals are worthy to be taken up. It will help us know more of the biology of plants and animals in the locality (where the school is situated).

### *Acknowledgements*

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## REFERENCES

- BARKER, J A "The Use of Zebre Fish *Brachy danio rario* for the Study of Embryological Developments in Schools," *J Biol Ed* , 6(4). 233-237, 1972
- KELLY, P J "Organism in Schools, Retrospect and Prospect," *Ed. Use Liv. Org.* 3-10 University Press, London, 1975
- KELLY, P J. & J.D. WRAY *Educational Use of Living Organisms*, pp-1-188, University Press, London, 1975
- KUHN, "Experiments with Display Patterns in Siamese Fighting Fish," *Amer Biol Teach* , 32(2) : 102-104, 1970
- MARTIN, D "Sticklebacks", *School Science Review*, 47(175), 417-227, 1967
- NCERT, Resources and Problems : An Investigation Project to Develop a Handbook for the Use of the Classroom Teachers, ERIC Proceedings, 1976 □

# Implication and Role of Cultural Behaviour in Life Science<sup>†</sup>

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SCIENCE, the systematic and formulated knowledge has, perhaps, a natural course of progress. In such a process the limitation and specialization of disciplines emerge and thereby the 'greater science' sets forth science and scientists. Again, the community of scientists makes reference groups among themselves, and the bases are laid on common interests (mostly academic, and that too is expected), understanding of the same problem from different perspectives and similar medium of technical communication. Physical science, natural science and even biological science might have developed in such circumstances. Relatively

recent outcome of a number of 'core science' may be explained in terms of intensive fractional interest on the one hand, and fusion with other fractions—related, or allied, on the other. The process as well as the result may be exemplified from the field of genetics. Plant genetics or animal genetics is hardly used, unless specifically asked for. As a matter of fact, the bondage of such 'core science' lies in the principles and methodology while other issues appear to be minor and insignificant.

In recent years, there has been a big

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toar about life science. Interestingly, the change-over of terminology is well marked, from 'biology' to 'life science'. But necessary explanations for this alteration of term is hardly met with, except the simplicity resulting from the English term instead of the earlier Greek derivation. Life scientists often attempt to justify the substitution of new naming as a form of breakthrough in the orientation of the aims and scopes of the subject and integration of methodology. One may, however, still enquire the utility of re-naming the subject despite the inclusion of multi-disciplinary approach for common themes. The most important part of neo-biology or life science is the realization about the need for an emphasis upon 'man'. Moreover, recommendations have been made about the teaching of biology "as one of the humanities" (Hall and Moog, 1955). It is interesting to note that in the concept of genetics, evolution, environment and ecology—the central focus is on man as a representative type, and a type agent in biological situations.

For an anthropologist the concept of life science is slightly perplexing. The major involvement of anthropological studies is centering round man and to fulfil the circumstantial need, the area and depth of research activities are broadened as and when necessary. Under such circumstances, one is likely to ponder over the matter, possibly, in two ways: (i) repetition or simultaneous existence of two different disciplines with more or less common aims and approaches; (ii) encroachment of a well-knit inter-disciplinary science of greater magnitude but recently formed over a traditional, inbred and static science.

It would not be out of place to mention here the above mentioned situation.

In the context of simultaneous existence, it is often observed by different disciplines in the studies in marginal areas. It is also conspicuous that in such circumstances the aims are overlapping and the approaches are mostly individual in nature. Unfortunately, strictly anthropological approaches are hardly met with, and mostly they are sheer imitations without much involvement in the basic and fundamental principles. It is not unlikely that to discontinue this state of enigmatic complex, an organized body of competence will change the overall set-up.

To anthropologists this is really unwanted, although it is, perhaps, inevitable. The main reasons for the chaotic lie in the constructional history and disjointed process of development of the subject. Unlike other sciences, anthropology possesses neither any basic core nor the root of its own. It actually came into existence in a way of assortment of a number of disciplines, both of science and humanities, which have something to do, directly or indirectly, with man. Despite this, the proper coordinator has not been really established and the relevance is mostly lost. Anthropologists, in most cases, have tried in vain to work on sporadic problems connected with man and except the topics on cultural factors all are scarcely meaningful. It is indeed true that the cultural milieu of man, even in the context of biology, is the specific domain of anthropologists, where other scientists might feel slightly uneasy. In spite of the fact, this special area is considerably neglected by the anthropologists themselves—and it is conspicuously true in Indian context.

The other side of the picture is more gloomy. At times fads are developed

and it is seldom possible to get rid of them. Inclusion of anthropology, as a total and distinct discipline, in 'social sciences' may be cited as a case of evisceration of the subject. Of course, social anthropology in the realm of sociology might have contributed methodology, data and even results and interpretations, and that in the mainstream of social sciences, but in no way it should affect the integrity of anthropology as a holistic discipline on the bio-cultural studies of man.

In fact, the present state is a critical stage for anthropology—for its existence and even survival as a specific discipline. With greater awareness we can possibly overcome the bewilderment and make attempt to develop the subject in its own way. The identity of the discipline can only be maintained by the sincere efforts and achievements of the scholars in their fundamental ideas and contributions. In integrated research, anthropology must have its own role—not merely marginal in nature.

The science of life (biology) or life science primarily describes, examines and discusses the life, activity and operation of both living and dead in different ecological niches, in varied spatio-temporal situations. In this mass workshop, the role and activities of anthropologists are immense, with especial reference to man—a biological being with the characteristic of cultural capabilities. Most of the participants in life science are basically involved with the living organisms in intensive details, covering the wide spectrum from the cell to individual. With respect to studies on man, a greater part of pure biological work is carried out by a number of disciplines which, in their turn, are within the domain of life science. The major disciplines invol-

ved on the studies of man are, human physiology, biochemistry, human genetics and even human biology. The latter one is more integrated in nature. Very seldom man is viewed as a distinct species from other animals. The distinctiveness is manifested through different cultural factors which are lacking in case of all other animals. It is mainly the cultural capabilities which from its very emergence, even in their incipient form, lead to the process of hominization. Human evolution cannot be understood as a purely biological process, nor can it be adequately described as a history of culture; rather it is the interaction between the two components of evolution—the biological or organic and the cultural or superorganic. The interdependence of these two components may clearly bring out that they both serve the same function—the adaptation and control of man's environment.

"The basic thesis is that the physical and genetic endowments of human species now living have evolved as a result of and hand in hand with the development of culture. That is to say, biological evolution and cultural evolution are interdependent" (Dobzhansky 1966: 193). Only the biological bases are not sufficient to account for, explain and understand the evolution of man. There is a good deal of resemblances between man, and anthropoid apes belonging to family Pongidae, and the evidences are: broad and flat chest, disposition of the internal visceral organs, construction of the basic pattern of brain (of course with difference in size and pattern of convolutions of the gray matter), limb bones, physiology of the brain, similar series of blood groups, serum proteins, morphology and total pattern of chromosomes, etc. On the other hand, the differences between man

and anthropoid apes are conspicuous. The evolution of modern man through different stages is evidenced from the fossil records which clearly suggest the enormous time depth for the process of development. Under such circumstances, "Probably the differentiation of man from ape will ultimately have to rest on a functional rather than anatomical basis, the criterion of humanity being the ability to speak and to make tools" (Le Gros Clark 1950). Both language and tools, the criteria of humanity, are the aspects of culture. The thesis on the role of culture and its bearing on human evolution has been aptly expressed by Washburn (1959) who writes. "Much of what we think of as human evolved long after the use of tools. It is probably more correct to think of much of our structure as the result of culture than it is to think of man anatomically like ourselves slowly developing culture". In case of evolution of man, culture "acts as supplement in biological evolution, but not the vice versa." In other words, cultural evolution is independent in nature more than biological processes. In certain cases culture acts as adaptive mechanism for the purpose of survival and sustenance of man in unfavourable ecological conditions.

At the present stage of knowledge it reveals that culture is only a human possession, "a species character of *Homo sapiens*" (Dobzhansky 1968). Or, it may be expressed that bearing of culture by man distinguishes him from all other animals. It is really high time to understand and define culture, not merely through conventional way but in the light of recent studies—especially on the non-human primates.

Culture has been defined in different ways and through various expressions. A simple survey of the definition only on

culture is indeed a voluminous work. It is probably better to examine and understand the meaning or connotation of culture from different perspectives, of course, in brief but comprehensive form. It is useful to discuss how culture has been looked at from different points of view with respect to specific disciplines and the resultant picture of emergence.

To start with, we may turn to cultural anthropologist. Tylor (1871), the progenitor, defines man's culture (*italics mine*) as *capabilities and habits acquired by man as a member of society*. In the definition the association between man and culture has been considered as a predetermined one, otherwise capabilities as well as habits are found to be acquired by other animals. In recent years another cultural anthropologist, Kessing (1958) suggests culture as "the totality of learned behaviour". The "learned socially transmitted behaviour" is found to be present among a number of living primates as pointed out by Zuckerman (1932, 1933) and similar observations in detail have been made very intensively along this line in recent years. Albert, the world "totality" is not well defined.

Let us examine the opinions of biologists on culture. Coon (1954), an anthropologist in profession but biologist in orientation, thinks culture as "the sum total of things that people do as a result of having been taught". Again, Oakley (1963) perceives culture as "the sum total of what a particular society practises, produces and thinks". In both the above mentioned viewpoints, the abstraction of totality is there and both the scholars have emphasized the learned behaviour which is not specifically human in nature.

To avoid the surfeit of definitions, finally we will simply try to observe the reaction of culturalogist on this issue.

White (1949), one of the pioneering investigators on culturalogy, as he speaks of himself, perceives culture as "extra-somatic, temporal continuum of things and events dependent upon symboling". This indicates that culture is mostly beyond comprehension by senses.

What would we conclude about "culture"? Especially in circumstances where the bias of human element is excluded, a test for the purpose of confirmation whether the characteristics of culture is present or not in other animals, or this is present only with man. In fact, "culture" as it stands is the assemblage of behaviours expressed in different forms within a social group, limited both by time and space. A greater part of the behaviour is learned in nature. It is without doubt that under the existing evidences, "culture" cannot be considered as specifically belonging to human domain. There are other forms of behaviour, as individual, instinctive and temporary. Our consideration concentrates only on cultural behaviour which needs to be explained and illustrated.

The group behaviour is formed through the process of learning, and the behaviours are, in most cases, possible for adaptation and adjustment in the exposure of a wide variety of circumstances (Washburn and Hamburg 1965). The critical learned behaviours are transmitted from one generation to the other, or even from one group to another, as essential elements for survival. The fitness of learning depends on several factors which are mostly genetically determined. These are the hindrances for which a chimpanzee could not be taught to communicate verbally—the language of chimpanzee and man is not genetically set or patterned. On the other hand, it was previously thought that the

behaviour pattern of offensive and defensive mechanisms through extra-corporeal organs, i.e. the tools, are the distinctive criteria of man, and the phrase "man the tool maker" was, and perhaps is, still in vogue. Intensive field investigations among the chimpanzees by a good number of scholars (Goodall 1963, 1965; Jones and Sabater Pi 1969, Nishida 1967, 1973, Struhsaker and Hunkeler 1971, Suzuki 1966, etc.) reveal that the non-human primates, more specifically chimpanzees, are able to make and use tools. Both the tool-making and using behaviours are also found in the form of learned behaviour. Tools made for specific purposes, as anti-gathering or poking, possess similar morphology and they are made by identical production technology. In view of this interesting discovery, it is not unlikely that some extinct forms which are closely related to man had the capability of making and using tools. Best example in this respect may be set forth, as advocated by Pilbeam and Simons (1965), from the *Ramapithecus* who used to live on the Indian sub-continent about 15 million years B.P.; whose reduction of the anterior dentation indirectly indicates at least the use of tools. The speculation for a normal culture with standardized tool making must have been preceded by a lengthy ad hoc tool-using (Napier 1963). In the research area of human evolution and taxonomic classification of Hominidae it is essential to include cultural traits, even in the primeval forms, along with the anatomical features and chronographic data. In the case of man, the cultural features are equally important as the biological traits, and more attention should be paid to the former to compensate the negligence shown to it so far.

At this point, it appears that it is still

an open question whether cultural behaviour can only be attributed to man, the complications arises as it is found among the living sub-human primates, and perhaps it was present among the extinct forms. Despite this there are some differences of cultural behaviour among man and other sub-human groups (Ghosh 1971). The connotation of the word tool is not exactly similar in the above mentioned cases. Tools produced and used by chimpanzee, may be considered as products of secondary character of activity for the purpose of adaptation and adjustment in an ecological condition which is either slightly unfavourable or serve the purpose of additional exploitation of food resources. Tool-making of this sort is the minimum requirement to cope with the condition, under the prevailing circumstances. Moreover, the level of tool-making and using is completely static without any further development. Similarly, the learning habits are recurrent and monotonous behaviour. The stagnation of this set of behaviour may be due to a lack of severe need, or due to biological limitation—perhaps genetically determined.

In the case of man, there is the developmental progress of cultural behaviour through time. Neither the cultural behaviour nor the evolution of the same is inherent, but human nature is probably evolutive in form and function. Unlike all other animals, especially the primates, man—the only single species—has the widest distribution. Man too is the most susceptible animal, both physiologically and psychologically, to ecological changes. As a result, instead of corporeal change, the adaptation and adjustments are made through spatial and cultural shift. For wider distribution of man, he faced the maximum number of crises, almost

continuously through time in different forms. Most of the crises are indeed critical in nature where the question of survival is very much involved. This is the most important factor which initiated gradual change-over in the form of progressive evolution.

The better ideas spread faster for the possession of communicability through language. From the very emergence of cultural behaviour in man it went on accumulating, each stage is the cumulative behaviours of all the preceding stages, and in all the cases both learned behaviours and addition of new developed behaviours acted simultaneously to give rise to cultural development in an evolutionary order. The cultural behaviour covers all the interrelated facets as material, ideological, social, etc. A slight change in one of these facets might bring about relative changes on other facets. This may be one of the prime reasons for the diversity of cultural behaviour of man in space and time.

Biology is concerned with time for the purpose of understanding evolution, and interpretations along this line are put forward in the background of the past. Life science does not describe merely the life of the present day but seeks to understand the forces that have been brought into being the myriad forms of life which constitute the biosphere. The forces are two-fold, within the organism and its environment. The creative forces are continuous and almost constant, which relentlessly determine the pattern of life—even of man. There is hardly any aspect of life which does not manifest adaptation for survival. The effective adaptation is revealed in terms of fitness of the individual or group survival, and the process never ceases because the circumstances are almost ever-changing.

Under all circumstances, man survives through time and at places he has radically altered his living conditions. All these win-overs on encounters have been possible for his manifestations and operations of cultural behaviours which are of higher order than all other animals.

Do the biologists behave properly with behaviour? Perhaps not as Tinbergen, "an ethologist, a zoologist, studying animal behaviour," himself writes (Tinbergen 1968) as a duty to remind his fellowmen (biologists). "The ignorance of ourselves which needs to be stressed today is ignorance about our behaviour—lack of understanding the causes and effects of the functions of our brains. A scientific understanding of our behaviour, leading to its control, may well be the most urgent task that faces mankind today". It is true that some amount of attention has been devoted to problems on behaviour, both of man and other animals. A greater part of the behavioural studies both on man and non-human primates is being carried out by anthropologists and to some extent by life scientists. The knowledge of the basic pattern of non-human primate behaviour has great relevance for deeper understanding of human adaptations which has the key-role in the destiny of man and his survival through time. A considerable proportion of his present-day behaviour can be explained and understood against the background of biological factors of continuity and resemblance and social heritage of primate and even of early man (Jay 1965). Besides the biological study of behaviour, the work on socio-cultural behaviour are included within the research area of anthropologists. One must be very cautious about too much generalization on the simple basis of ethology, otherwise it may overplay the functional

comparisons between animal and human organizations. With this warning, Callan (1970) has suggested the possibilities of work along the direction of inter disciplinary efforts between ethology and anthropology.

The behaviour of organism, both plants and animals from the minute to larger forms, consists of observational change in response to the internal or external stimulations. In the reactionary process, the behaviour is reinforced by continuation through positive feedback, or there may be the replacement of new behaviour pattern. Rejuvenation of a coherent science on behaviour is urgently needed to meet the existing demand. As the problem is a part of the life process, it requires to be considered as a part and parcel of the mainstream of biological research. Most of the modern ethologists stressed the need on methodology or approach of behaviour and the involved mechanism, along with the factors responsible and the adjustment and adaptation in changing circumstances. The expressed behaviour pattern of the organism may be considered mainly in the domain of cultural behaviour, and the internal behaviour and the reactions thereof are included in the form of biological behaviour. In the case of higher animals, both the behaviours act hand in hand...

The usefulness of the study of cultural behaviour in life science is indeed enormous. Cultural behaviour of man of course helped him to survive on the one hand, and on the other the same is also responsible for the disappearance of man at his early stages. Again the disappearance of one group lead to the emergence of other group in the historical process of hominization. Factors responsible for differentiation or change of cultural behaviour are also acting in

modern times, and at times with greater intensity. Cultural behaviour of man is associated with technology. At the outset, the technology had its role for survival which later developed into better living. The development of technology is a continued one. Cultural behaviour had its development earlier and now it is hard to say whether it is developing, but undoubtedly it is changing and the direction of which is relative in nature. The incompatibility between the components of cultural behaviour and technological factors may lead to great catastrophes, as Tinbergen (1968) remarked: "It is the effect of our behaviour that begins to endanger the very survival of our species,

and worse, of all life on earth"

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The underlying idea of the present topic at its formative stage was much appreciated by Professor S. P. Roy Choudhuri. The author concedes that the remarks of Professor Roy Choudhuri are the main incentives for the preparation of the paper.

## REFERENCES

- CALLAN, HILLARY *Enthology and Society—Towards Anthropological View*, Oxford . Clarendon Press, 1970
- COON, C.S. *The Story of Man*, New York : Manopf, 1954
- DOBZHANSKY, T. *Human Biology*, 35 . 311-316, 1963
- Mankind Evolving—the Evolution of the Human Species*, New Haven . Yale University Press, 1966
- GHOSH, A.K. *Proceedings of the Anthropological Congress dedicated to Ales Hrdlicka*, Ed by Vladimir V. Novotny, pp. 89-100, Praha . Academia, 1971
- GOODALL, J. *Symposia of the Zoological Society of London*, 10 . 39-47, 1963, *Primate Behaviour—Field Studies of Monkey*, Ed I De Vore, pp. 425-473, New York . Holt, Rinehart and Winston, 1963
- HALL, THOMAS S. and FLORENCE MOOG, *Life Science—A College Textbook of General Biology*, New York . Hohn Wiley and Sons Inc., 1955
- JAY, PHYLLIS, *Primate Behaviour—Field Studies of Monkeys and Apes*, Ed. I De Vore, pp. 197-249, New York . Holt, Rinehart and Winston, 1965
- JESSOP, N.M. *Biosphere : A Study of Life*, Englewood Cliffs, New Jersey : Prentice-Hall, Inc., 1970
- JONES, C. and J. SABATER PI, 100-101, 1969
- KESSING, F.M. *Cultural Anthropology*, New York . Rinehart, Le Gros Clark, W.E. *History of Primates*, 2nd edition, London . British Museum, Natural History, 1950
- NAPIER, J.R. *Classification and Human Evolution*, Ed. S.L. Washburn. pp. 178-184 . Chicago . Aldine, 1963

NASHIDA, I. *Shizea* 22 (8) 31-41, 1967, *Journal of Human Evolution*, 2(5) 357-370, 1973

OAKLEY, K.P. *Man the Tool Maker*, 5th edition, London British Museum, Natural History, 1963

PILBEAM, D.R. and I.L. SIMONS, *American Scientist*, 53(2) 237-259, 1965

SIRUBAKIR, I.L. and P. HUNKLER *Folia Primatologica*, 15 212-219, 1971

SUZUKI, A. *Primates*, 7 (4) 4181-487, 1966

TYLOR, E.B. *Primitive Culture*, London John Murray, 1871

WASHBURN, S.L. *Human Biology*, 31 - 21-31, 1959

WASHBURN, S.L. and D.A. HAMMERS, *Primate Behaviour - Field Studies of Monkeys and Apes*, Ed. J. De vore., pp 1-13, New York : Holt, Rinehart and Winston, 1965

WHITE, L. *The Science of Culture*, New York : Grove Press, 1949

ZUCKERMAN, S. *The Social Life of Monkeys and Apes*, London : Kegan Paul, Trench, Trubner, 1932

— *Functional Affinities of Man, Monkeys and Apes*, London. Kegan Paul, Trench, Trubner, 1933





# Some Interesting Tests in Life Science for Secondary Schools

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## TEST FOR PROTEINS

**A. Adam Kiewicz's Reaction :** To 5 ml of plant extract in a test tube add a drop of glacial acetic acid and shake it thoroughly. Add conc.  $H_2SO_4$  very slowly, drop by drop, to solution till a ring appears at the junction of the two liquids. This is a general test for proteins.

**B. Biuret Test :** Take 10 ml of aqueous extract of plant tissue, preferably germinating seeds or gelation or egg albumen, in a test tube and add 1 ml of 4% NaOH solution. Then add one drop of 1%  $CuSO_4$  solution. A violet or pink colour is

produced. This colour indicates, and is a general test for proteins containing the—CONH—group.

**C. Sulphur Test** Boil 5 ml of plant or animal tissue extract with an equal volume of 40% NaOH with a drop or two of 10% lead acetate. The solution turns black or brown due to the formation of  $PbS$  (lead sulphite) by the action of strong alkali on the sulphur of the protein.  $Na_2S + (CH_3COO)_2Pb = PbS + 2CH_3COONa$

This is a positive test for the sulphur containing amino acids, e.g. cystine or methionine, etc.

## TEST FOR CARBOHYDRATE

**D. Moisch Test :** An aqueous extract (10 ml) of plant or animal tissue is shaken with a few drops of alpha-naphthol solution (1% naphthol) in 70% alcohol. Concentrated  $H_2SO_4$  is carefully added drop by drop to the inside of the test tube so that it slides along the side. A violet ring or usually a violet colour is formed at the junction of the two liquids. This is a general test for all carbohydrates.

## TEST FOR SUGAR

**E. Fehling Test.** To an aqueous extract of a tissue in a test tube, add an equal volume of Fehling A and B mixture. (Fehling A : 35 gm of  $CuSO_4 \cdot 5H_2O$  in 500 ml of water; Fehling B : 50 gm of NaOH and sodium-potassium tartarate 173 gm dissolved in 500 ml of water). Boil in water bath. An orange red precipitate of  $Cu_2O$  shows the presence of reducing sugars.  $Cu(OH)_2$  is reduced to  $Cu_2O$ , whereas reducing sugars are oxidised to their corresponding acids.

**F. Moor Test :** Boil an aqueous extract of plant tissue or blood serum with an equal volume of 4% NaOH solution. If free glucose is present, the solution turns yellow and then reddish brown due to the formation of a condensation product (caramel) of the sugar.

## TEST FOR STARCH

**G. Iodine Test.** Take starch grains (teased from potato) on a slide and add a drop of dilute aqueous iodine in KI solution (0.5 gm of iodine and 0.5 gm of KI in 100 ml of water). The starch will

turn blue-black, which can be easily seen under the microscope.

## TEST FOR FAT

Take scales or sections of fatty seeds (Sessamum (Till) seed) and place them in a solution of Sudan III and allow the sections to stand for 20 minutes. Wash in 50% alcohol and then in water and mount in glycerine. Observe the red-stained oil drops which can be seen floating around the section as well as in the cell inside. The same test can be carried out for animal fat also.

Sudan III is prepared in 70% alcohol. A saturated solution of the dye is used.

## CULTURE OF PROTOZOA

*Aim :* Preparing culture of the protozoans in hay-infusion medium.

*Materials Required :* Beakers, chopped hay, 1N NaOH, crushed wheat grains.

*Procedure* Boil 10 gm of chopped hay in a litre of tap water for about 30 minutes. Filter and add 1 or 2 drops of 1N NaOH solution. Cool and add a pinch of soil. Then add a few crushed, cooked wheat grains. After a day inoculate it with pond water containing protozoans. Keep it for few days or a week. Then observe a drop of the solution under the microscope to see the protozoans. The common organism occurring in the infusion are Eulplotes, Vorticella, Stylonychia and other protozoans.

*Preparation of 1N NaOH* 4 gm of NaOH pellets in 100 ml of distilled water.

### GERMINATION OF POLLEN GRAINS

*Aim* : Studying the germination of pollen grains.

*Materials required* : Cavity slides, fresh pollen grains, preferably from Solanaceae like Petunia or Balsam belonging to the family Balsaminaceae, 1% glucose or sugar solution.

*Procedure* : Place a few drops of glucose solution in the cavity of the slide (order for single cavity slides from the dealer of scientific equipment) and tease in it a few pollen grains from a fresh anther. The flower may be collected before anthesis (that is just before the opening of flower). Place a cover glass over the material and leave it aside for at least  $\frac{1}{2}$  to 1 hour. Observe under a microscope. You will see pollen tubes emerging from the pollen grains. There will be differential rate of growth of the tubes in different pollen grains. The exine will be forced open and the contents of pollen will emerge as a tube limited by a wall of its own.

*Caution* : Pollen grains of all plants will not germinate. Best results are obtained with Petunia or Balsam pollen. Trial may be done with those pollens which show a smooth exine.

Instead of glucose or sugar solution, one can prepare an extract of the style and place it in the cavity and place the pollen of the same plant from which the style extract is made. This is found to hasten the germination of pollen. Include the stigmatic surfaces also while making the extract. Avoid sugarcane pollen since it is short-lived.

### MACERATION OF PLANT TISSUES

*Aim* : Sections of plant parts such as

stem, root, bark and other organs rarely convey an accurate conception of the real nature of the cells of which they are composed. The only method by which the cells are revealed in their entirety is the dissociation method. In this procedure, the stem or other organ is treated with such chemicals which will dissolve the middle lamella and allow the cells to dissociate from one another. Further, the secondary xylem, their pores, perforation plate and other distinguishing feature of the secondarily thickened cells are clearly brought out.

*Procedure* : First cut the materials into small slices of about 2 cm square or less. Either boil and cool the material repeatedly until the material is free from air and sinks to the bottom of the beaker, or use the suction pump which hastens the evacuation of air. Macerate the material in a solution of equal parts of 10% aqueous nitric acid and 10% aqueous chromic acid. Keep the materials in the macerating fluid for 24 hours. Thick woody materials may be left overnight in an hot-air oven at 60-70°C and this hastens maceration. Wash material thoroughly in water and keep a slice of the material on a slide and crush it by a thick rounded head of a glass rod. Again wash thoroughly in water to remove the acid. Stain the material in aqueous safranin and observe under the microscope. (Aqueous safranin is made by dissolving Safranin (1 gm) in 100 ml of distilled water.)

*Caution* : The material should be washed thoroughly in water; otherwise the acid carried over in the section will damage the microscope lens.

# CLEARING TECHNIQUE FOR THE STUDY OF WHOLE PLANT PARTS

*Aim :* Young plant parts such as shoot tips, flower buds, leaves, etc. are beautifully cleared by this technique and reveal their internal venation pattern, etc. very clearly.

*Materials Required :* 2% NaOH solution, 50%-100% ethyl alcohol series, xylol, slides and cover glasses; mounting medium.

*Procedure :* Prepare a 2% NaOH solution in distilled water. Leaves may be cut to small bits smaller than the size of the cover glass to be used. Place the material in 2% solution of NaOH for several hours. The time for cleaning varies according to material. Young plant parts take about 24 hours. While the mature leaf segments take 48 to even 72 hours. If the solution turns black after a few hours, give a change with fresh NaOH. Stubborn materials may be kept in an hot air oven at 60°C overnight. First the material usually turns whitish or opaque, and then start to clear, revealing the internal structures. Some materials turn brown to black initially but clear later after prolonged treatment in the alkali. Wash the material in several changes of distilled water to remove the alkali thoroughly and pass through alcohol series (starting from 50% through 60%, 70%, 80%, 90%, 2 changes in 100%) and stain in safranin in equal parts of alcohol/xylol mixture. (Stain is made by dissolving  $\frac{1}{2}$  gm safranin in 50 ml of absolute alcohol. Lesser quantity may also be made accordingly) Wash briefly in alcohol/xylol mixture to remove excess stain. 20 minutes placement in alcohol series and 2 minutes in stain is enough for most of the material. After alcohol/xylol, by

now the material should be completely transparent and cleared and beautifully stained. Epidermal peels may also be treated in the above manner to study the stomatal structure and distribution. Permanent slides may be made by mounting the material in canada balsam or DPX mountant. Small gram weight may be placed over the cover glass so that the material dries up in a flat position and does not buckle under cover glass. During dehydration, avoid fan or breeze flowing across the materials since this would impair the dehydration process.

Alternately, the cleared leaf from alkali may be washed thoroughly in distilled water and stained as noted below to study the stomatal structure. Place the material in 1% aqueous tannic acid for 10 minutes. Wash thoroughly in distilled water. Place the material in 2% ferric chloride solution (aqueous). The material will turn blueblack or brown. Observe under microscope. The cell-wall should be black and cell contents almost colourless or in light shade of grey. If staining is not sufficient, alternate between tannic acid and ferric chloride as before. After tannic-acid-ferric-chloride treatment, wash the material and pass through 50% to 70% alcohol with 3-5 minutes in each stage. Stain in alcoholic safranin for 5 minutes. (1 gm of alcoholic safranin in 100 ml of 70% alcohol) Wash the excess safranin in a change of 70% alcohol. Pass through 80% to 100% alcohol with 5 minutes at each step. Give a change of alcohol/xylol mixture for 5 minutes. Place in xylol-2 changes and mount in canada balsam or DPX mountant. This is by far the best method to demonstrate clearly the stomatal structure, palisade and other leaf parts under different foci of the microscope. This is a fool-proof method of preparation of material. Even

the sclerids in leaf will be beautifully stained with this method. If the teacher is interested to reveal only structures like sclerids, etc., staining with tannic-acid-ferric-chloride may be avoided in the first stage and the material may be stained in safranin after clearing in alkali and further processed.

#### SQUASH OR ACETOCARMINE TECHNIQUE FOR CYTOLOGICAL STUDIES

The acetocarmine system was developed by John Belling and has proved to be of interesting value. This system is effective in cytological studies with a wide range of plant and animal tissue

*Preparation of the Stain :* To 45 ml of glacial acetic acid in a pyrex conical flask, add 55 ml of distilled water and boil. Weigh 1 gm of acetocarmine stain and add slowly to above solution with constant stirring with a glass rod. Cool the flask to room temperature and filter and store the solution in a glass stoppered bottle. Add two drops of ferric chloride solution to it

*Procedure to Study Mitosis* Fresh onion root tips may be studied. However, we recommend fixing the onion root tips previously for 24 hours in FAA fixative (This fixative is made by mixing 10 ml of commercial formalin, 5 ml of glacial acetic acid and 85 ml of 70 % ethyl alcohol). The young root tips may be fixed in this solution for 24 hours and then stored in 70% alcohol for future use.

Place the fixed or fresh onion root tip in N/10 HCL for 5-10 minutes. Wash the tips thoroughly in distilled water. Place the tip over a clean glass slide in

a drop of acetocarmine solution. Squash the root tip in the above solution with a non needle. Warm the slide over spirit lamp (warming should be such that the slide when touching your skin will make you feel the pinch. Do not boil. Place a cover glass over the material and keep a blotting paper over it and gently but firmly press it (squash the material and not the cover glass) with the thumb. Observe under microscope

For Meiosis, onion flower buds, *Tradescantia* flower buds or Grasshopper testes may be chosen. In areas where ferns are plenty, fern sori may also be substituted to study meiosis. In any case, choose the youngest flower buds or sori. Follow the same procedure stated above.

*Caution* It is a must for a teacher to make test studies at various times both for mitosis and meiosis. Sample should be squashed at intervals of 1 hour during day and night. In Bhubaneswar, where the mitotic and meiotic slides were prepared so beautifully, it was established that the peak period of division was between 2.00 and 3.00 A.M. and 2.00 and 3.00 P.M. at the room temperature of 30°C during daytime and 28°C at night. It is likely that this time is subject to variation according to temperature and other factors. Hence the teacher is advised to make test studies.

Further, onion takes sometimes to root. Hence the teacher may keep several of these inverted over bottles of water so that the root end is just touching the water. Within 8 days the rooting commences. The removal of a very thin slice from the root base before placing over water hastens root formation considerably.

## BLOOD SMEAR

*Material Required* . (a) Microslides, (b) Leishman's Stain (0.15 gm Leishman's powder in 100 ml of methyl alcohol. Mix the two and keep for 24 hours at room temperature with occasional shaking).

*Procedure* : Take a drop of blood of toad or man at one end of a slide and smear it by dragging another slide over it (at 45° angle) Dry and put the (Leishman's) stain over it. Keep for few minutes and drain out the extra stain. Wash in running tap water and dry the slide. Observe under microscope. Compare the two smears and record your observations.

## MOUNTING OF MUSCLE FIBRE

*Materials Required* : Toad; Microslides and cover slips; Borax carmine stain; Forceps and needle.

(8 gm of Borax, 200 ml of water and 6 gm of carmine powder. Mix them and boil for about 30 minutes. Dilute with 200 ml of 70% alcohol).

*Procedure* : Tear out a single muscle fibre (thigh muscle) of toad and observe under the microscope to confirm the clarity of the muscle. Stain it with borax carmine. For a permanent preparation, pass it through alcohol gradations followed by xylol and mount in DPX or canada balsam.

## PROCESS OF DIGESTION

*Aim* : To demonstrate the process of digestion in vivo in the experimental

animal (Toad) and to test for proteins, amino acids, starch, glucose, fat and fatty acids

*Materials Required* : Health toads, glass tube with rubber pillar, test tubes, beakers, hot water bath. Iodine crystals, Potassium iodide, Biuret (copper sulphate + sodium hydroxide) - sodium potassium tartarate) Ninhydrin, Benedict's solution, Sudan III.

*Experiment*

1. To a portion of starch add iodine in potassium iodide sol.
2. Take a little of sugar or glucose solution Add Benedict's reagent and warm it.
3. To a portion of Mayer's albumin or any other protein add Biuret sol.
4. Treat amino acid solution with Ninhydrin and warm
5. To a little of oil (white in colour) or fat, add Sudan III.
- 6a. Add a few crystals of powdered pot. hydrogen sulphate to a few drops of glycerol and heat it strongly
- 6b. Pass this vapour (obtained by above process) into cold water. Now treat the sol. thus obtained with Schiff's reagent.

*Step II (A)* : Take the starch solution, divide this into two portions. One portion is to be tested for starch and to the other portion add saliva. Shake it well and allow it for some time. Divide this into two parts. Test one part for starch and the other for sugar, alcohol, acetic acid, potassium hydrogen sulphate, Schiff's reagent, Glycerol, Mayer's albumin, starch, sugar or glucose, castor seeds.

*Procedure* : The test for starch, sugar, proteins, amino acids, lipid (fat), and glycerol will be conducted. The food

contents in the stomach, duodenum and intestine of the animal will also be tested

*Step I.* Test for starch, sugar, proteins, amino acids, fat and fatty acids

<i>Observation</i>	<i>Inference</i>
Turns bluish	Starch present
Brick red colour	Glucose or sugar present
Pink colour	Protein present
Pink	Amino acid present
Brick red colour	Fat present
A vapour with a very irritating smell of Acrolin produced,	
Pink colour appears	Glycerol present.

(B) Insert a glass tube into the stomach of Toad through the buccal cavity and collect the substance present in the stomach. Divide the contents into six parts. Test each part as per the above chart and note your observations and draw inference.

(C) Cut open the given animal and take duodenum part, wash it thoroughly in a beaker. Collect the washing and divide into six parts and test for different constituents as given in table above. Note your observations and draw your inference.

**Preparation of Biuret :** Make the following two solutions, Solution A O. 01 M Copper Sulphate ( $\text{CuSO}_4$ ) (Dissolve 2.5 gm of  $\text{CuSO}_4$  in 1000 ml of water)

*Solution B* 10M Sodium hydroxide ( $\text{NaOH}$ ) Dissolve 440 gm of  $\text{NaOH}$  in sufficient water. Biuret reagent Mix solutions A and B in equal volumes and add sodium potassium tartarate until the precipitate dissolves

**Preparation of Benedict's solution:** Make the following two solutions.

*Solution A* Dissolve 173 gm of crystalline Sodium citrate ( $\text{C}_6\text{H}_5\text{Na}_3\text{O}_7$ ) and 10 gm of anhydrous Sodium carbonate ( $\text{Na}_2\text{CO}_3$ ) in 800 ml of water. Stir thoroughly and filter. Collect the filtrate.

*Solution B* Dissolve 17.3 gm. of Copper sulphate ( $\text{CuSO}_4$ ) in 100 ml of water

**Benedict's reagent:** Mix solution A and B in equal volume

**Preparation of Sudan III reagent.** Make a saturated solution of Sudan III in 50% alcohol and filter. The filtrate can be used as a reagent.

**Preparation of Ninhydrin.** Dissolve 0.1 gm of Ninhydrin in 100 of acetone. □

# Educational News

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## New scientific discovery : Hybrid cell

WORLD's first living organism constituted of half plant and half animal, has been produced by two British Scientists Lucy and Cocking. They have been busy in creating artificial *heterokaryons* between two different species for a long time. The scientists are hopeful that even human cell can be used in future, which will be beneficial in biological and medical researches particularly in cancer research. The successfully developed plant-animal hybrid has been kept alive for a long period. The cells of yeast—a microscopic fungus used in brewing—have been fused with red blood corpuscles of hen. Scientists are confident that by using fast-dividing cells instead of the red blood corpuscles, the produced organism will divide and grow rapidly.

In 1970, the British botanist Cocking reported his first success by employing a new technique to persuade the cells from different species of plant to fuse. His technique involved taking out small pieces of leaves from wheat and rye, and using an enzyme solution to dissolve away

the hard walls from their cells, exposing the naked, flexible protoplasts which are eventually persuaded to fuse into *heterokaryons*. He succeeded in fusing. The pollen grains from two different species together and the living plant cell with bacteria. This invention comes with the prospect of developing new breeds of crop plants. These plants are able to fix their own nitrogen through permanently fixed appropriate genes from the bacteria. This will be of tremendous benefit to the agricultural world.

Similar experiments with animal cells taken from more than one species have been performed by a British zoologist Lucy. He has tried the same compound (*polyethylene glycol*) which has been used by Cocking in fusing plant cells and hopes that it would persuade the plant and animal cells to fuse together. Later on, both the scientists started culturing yeast cells. These yeast cells were mixed in a solution after removing their cell walls with a washed preparation of hen blood cells and incubated with polyethylene glycol which shrinks the cell without killing them. After subsequent dilution of glycol the cells ex-



pand back to their normal size fuse more easily. Thus they succeeded in producing a hybrid cell. The cells examined under electron microscope showed that the plasma membranes of each cell had completely fused forming broad bridges. Some of the fluid containing cavities of the cells also appeared fused, indicating that their mixed membranes too, had fused completely.

Now the scientists are busy in observing whether this hybrid cell behaves like plant or animal. Will the chromosomes of one 'parent' gradually be expelled from the *heterokaryon* or from its descendants if it goes on dividing itself? Or will the two sets live side by side? Experiments are being planned to find out a substitute with fast dividing cells for the red blood cells. In future the possibilities of using green plant cells from higher plants will be studied. This invention will be helpful in various fields of biological and medical researches with an exciting possibility of growing plant-animal hybrid tissues on a large-scale as food for animals and perhaps for men. The animal-yeast hybrid could also combine nutritive qualities of animal protein with the ability to grow on a wide range of substrates including wastes. Hybrids between animals and higher plants, or perhaps algae, would be able to draw energy from the sun by photosynthesis. The experiments will open up new possibilities for the creation of new living tissues to overcome the problems of food shortage, pollution control and waste disposal.

### An improvised simple microtome

AN EASY way to make thin sections with the help of an improvised microtome has

to be popularized in the Indian secondary schools. The materials required are nut and bolt ( $2.5 \times 7.5$  cm), paraffin wax and sharp single edged razor blade. Some glass container can be used for melting paraffin. The organ of the plant or animal to be cut should be suspended vertically in the nut placed on a paper sheet. Then pour melted wax into the nut holding the material in correct position and allow the wax to cool. The bolt is screwed to force the embedded material upward. The sharp-edged razor blade is employed to square up wax and to get thin slices of the embedded material. The bolt can be screwed  $\frac{1}{10}$  to  $\frac{1}{8}$  of a turn to get thin sections. The thickness of the sections can be reduced by using the nut-bolt with very thin turns.

It is the best and cheapest method for taking out the sections of  $10-20\mu$  thickness. It will come handy for the students of secondary schools. Permanent slides of the material can be prepared after dehydrating through a series of alcohol grades which can be stained with appropriate stains if desired. The internal structure of the stem, root and leaf and even animals' organs can be effectively shown and explained to the secondary students.

### Education is everybody's job

*How can the school be more fully integrated into the life of the community? This is a problem faced today by countries as widely separated as Sweden and Tanzania, the Philippines and Peru. In the last named country the two-way relationship between the school and the community is one of the main features of the educational reform initiated in 1971 and whose slogan—"Education is everybody's job"—has become popular throughout the country. It is the*

*foundation of the open school where life in the widest sense and not merely classroom teaching is the fabric of education.*

*The following write-up describes how one of these new schools, the Villa El Salvador Education Centre, was established in a poor quarter of Lima. It is an edited and abridged version of a paper presented by Rolando Andrade Talledo, director-general of Peru's Education Initial y Basica Regular, to a meeting of expert convened by Unesco in Paris last year to advise on innovative programmes and projects in the Organization's network of Associated Schools.*

IN 1971, when a general report on the educational reform was published, a series of land occupations took place in Lima, Peru, which resulted in the appearance of the largest shantytown in the capital el Pueblo Joven Villa El Salvador.

The people there were without work and without any kind of services in particular, without any educational centre.

A group of teachers installed themselves in the shantytown. Through meetings organized with the inhabitants they learned that what was needed was education which would not only provide schooling for the young people but would also develop solidarity among the elders in finding solutions to their problems. Thus came into being the Communal Education Centre of Villa El Salvador.

Parents and young pupils took part in constructing the premises, seven classrooms built of matting and wood. They also met together to consider what type of education should be provided.

Class committees, organized to discuss the community problems as well as those of the school, dealt with such subjects as the organization of life in the quarter (many of the pupils' parents now exercise responsibilities in the neighbourhood), as well as the main problem of unemployment.

Despite great difficulties and small

resources, a construction workers' co-operative was set up, and women's workshops for making clothing were established. These measures did not solve the unemployment problem, but they helped strengthen the people's solidarity and resolution, while providing a partial solution to their immediate economic needs.

For the pupils, the changes went deeper. The entire system of study and training was modified. Co-education based on group work was introduced: less reliance was put on memory, and intellectual study unrelated to the life of the community was replaced by *education for work in the service of the community*.

To facilitate these activities, the *information sheet* system was used. These sheets partly replace textbooks. They have the advantage of being adapted to the realities of the environment since they are prepared by the group and kept up-to-date as regards changes affecting the community. School textbooks thus become works of reference and support. The teacher no longer dictates lessons but guides teamwork, answering the pupils' questions, listening to their suggestions and developing with them concrete projects serving the community and the centre.

A students' council composed of delegates from classes is responsible for programming and directing school and out-of-school activities, organizing meetings with parents, taking part in community meetings, etc.

Finally, the centre's cultural action helps to strengthen links with the community. There are frequent film showings, a choir has been formed and four theatre groups from the centre give performances every Sunday in the neighbourhood parks and in different network centres.

## Film on environment and pollution

TWO YOUNG BRITONS, Nichola Bruce and Mike Coulson, have won the £350 first prize in the 17-24 age category for their *Breath of Air* in this year's International Film Contest for Young People. The international jury praised the film for revealing the fundamental causes and problems of the human habitat in a dramatic way.

First prize in the 12-15 age-group (£250) went to Agnes Pasztor and her pupils in Hungary for *What If?* In it a group of 12-year-olds living in a tenement tell their own stories set to their own music and sung by themselves. The jury found the film an excellent, imaginative presentation of the children's concept of their urban environment.

The contest was sponsored by the International Council of Graphic Design Associations, ASIFA (International Animated Film Association), BBC-TV and Unesco. The theme was the human habitat.

Second prize (£150) in the older age category went to *Question Mark* by Stephen Volk of Great Britain and third prize (£100) to *Ode to Joy* by Tibor Moldvanyi of Hungary.

In the younger category, second prize (£100) was split equally between two French entries *Different Life, Different Town* by Umberto Baramonte, Claire Dardorze, Valery Guicho, Christopher Journe and Pierre Montaton and *As Lucky as Ulysses* by Bruno Barbieri, Pierre Ordonnez and Philippe Quoturel. Third prize (£50) went to the British entry, *A Parable for Our Time*, by Jill Pendleton, Gillian Hague, Carole Lancaster and Elaine Baxter.

Thirty-nine films were submitted from a number of countries.

*Unesco Features*

## Education in the land of Sheba

ACCORDING to legend, the Queen of Sheba who visited King Solomon and, as the Bible says (1 Kings 10. 13), received from him "all that she desired, whatever she asked," was Balkis, Queen of Saba.

Her land in southwest Arabia was rich in gold, frankincense and myrrh. The ancient Greeks and Romans called it Fortunate Arabia (*Arabia Felix*) because of its agricultural and commercial wealth. Today it is known as Yemen, a name said to be derived from *ymn*, the root of the Arabic word for prosperity.

As part of their efforts to raise this land from the decline it suffered in recent centuries, the governments of the People's Democratic Republic of Yemen (Aden) and the Arab Republic of Yemen (San'a) want their women to be able to play a role in public life, as Queen Balkis certainly did.

### *Importance of equal access to education*

To accomplish this, the two governments realize that education is vital for women, and so both Aden and San'a have set up projects to this end in which Unesco is participating.

One, the first of its kind in an Arab State, is concerned with increasing girls' enrolment in primary schools. It is underway in Lahij, an important cotton and fruit-growing region northwest of Aden. The area was chosen because it had the lowest ratio of girls to boys in school in the whole P.D.R. Yemen.

The other project is a women's education unit set up in the San'a Ministry of Education.

In the years since 1968, when the P.D.R. Yemen became independent, the Aden government has enacted laws to free women from the age-old limitations of being wives and mothers only.

Polygamy is now illegal as is child marriage. A girl must reach the age of 16 before she can be married. With their new status, women are showing a thirst for knowledge which the joint Unesco-Yemen action will help to assuage. First the National Commission for Unesco in Aden is studying just what the obstacles are to women's and girls' education, and working out solutions with Unesco assistance. In the second stage, a plan of operations will be drawn up prior to launching an experimental project for equal access of girls to education.

To save precious teacher-power—until the training programmes catch up with the teacher shortage—and to make the maximal use of school buildings and other facilities, a shift system has been adopted in which the children are taught by day and adults at night.

#### *Overcoming parental hesitancy*

Co-education is widely practised in primary schools where children are taught by teachers of both sexes. In the past parents hesitated to send girls to classes taught by men, but with the new parent-teacher relationships this taboo is expected soon to become a thing of the past. Married teachers are encouraged to continue their careers and indeed about 50 per cent of the women teachers are married.

In San'a, the unit dealing with women's education at the Ministry consists of three Yemeni specialists and two Unesco experts. This team has become a familiar sight travelling in their Unesco mini-bus to the villages of Imran and Hada around the capital where two educational centres have been set up. These centres consist of regular primary schools and are used as such in the morning. Later in the day, however, volunteer staff come out from San'a to teach three

groups: girls aged 15 to 25, women over 25 and children who have missed school altogether.

The girls between the ages of seven and 14, who have never gone to school, are expected to attend the classes for three years. Besides basic reading, writing and some arithmetic, they learn about mothercraft, especially the basic methods of hygiene for bringing up a healthy child, food conservation, sewing and the fundamentals of home economics.

Pupils in the two other groups, many of whom are mothers, study Arabic, arithmetic and some elementary science with the accent on hygiene, for five to six months.

Learning is a new family experience for these people. It is not uncommon to see three generations of women from the same family studying together while perhaps the baby of the fourth generation is looked after by a young girl in the corridor. And father is not left out. Often as the women of the family leave their classes he can be seen arriving for night school.

*Unesco Features*

#### **A book on adult education\***

MR. John Lowe, in *The Education of Adults: A World Perspective* examines the history, present status and requirements of adult education from an international viewpoint. He discusses its functions, which vary widely between different countries and regions, the ways in which it can be made available to the maximum number of learners and the different structures adopted to meet specific situations.

The last include "school farms" in

Nicaragua, "citizens' public halls" or multipurpose cultural centres in Japan, Iran's rural cultural centres, comprising a library, mobile cinema, sports field, vocational and literacy classes and often a television club, while Kenya is developing village polytechnics where the stress is on education for self employment in such fields as carpentry, masonry or book-keeping. Here, as in the industrialized societies, the use of television and audio-visual methods is assuming ever greater importance.

Mr. Lowe has chapters on "unmet needs and target groups", "changing structures", "programmes and content", methods and material", and on administration and organization of adult educational structures

*Unesco Features*

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## FROM THE FIELD UNITS

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### POONA

#### GOA REGION

#### **Konkani as a Subject of Study up to S.S.C. Level**

THE Government of Goa has accepted Konkani as a regional language up to Std. X in its schools. This decision followed the report of a three-member committee which went into the question of the inclusion of Konkani as a subject for the S.S.C. Examination. The S.S.C. Board is consi-

dering questions like preparation of textbooks in Konkani, the curriculum and qualifications of teachers appointed to teach Konkani in schools in Goa. It has been officially decided that special arrangements would be made to enable all the 200 students who have opted for Konkani to appear for the S.S.C. examination with Konkani as subject of study. The Konkani Bhasha Mandal has agreed to help in preparing a textbook for studies in Konkani. The S.S.C. Board will prepare a syllabus in Konkani for Stds VIII to X.

### MAHARASHTRA REGION

#### **Language Development Project**

WITH the assistance of the Central Institute of Indian Languages (CIIL), Mysore, and aided by the Ford Foundation the Bombay Municipal Corporation has launched a Language Development Project (LDP) with the aim of improving the teaching of languages in schools. Inaugurating the Project on 13 July 1976, Dr Pattanayak, Director of CIIL, Mysore, said that it was the first of its kind to be started in the country and that its results would be of immense value to teaching and learning of languages not only for the country but also for the entire world. Instead of spending 53 per cent of the total instructional time in schools on teaching of languages (as is being done today), new methodology would help to achieve the same objectives in half the time. The present project started by the Corporation has a three-fold objective (a) improving the teaching of the mother tongue, (b) skill oriented teaching of mother tongue along with other languages and (c) methodological teaching of languages with the help of bilingual transfer method. The

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\* *The Education of Adults* by John Lowe is available from the Unesco Press, Unesco, Place de Fontenoy, Paris at 30 francs a copy, and from national distributors. In Canada it is available from O.I.S.E., Toronto.

Project also envisages setting up of a development centre for the study of effective methods of teaching and learning different languages, setting up of language laboratories for teaching of English and other languages, preparation of materials, and development of a research and evaluation unit.

Considering that there are over 1,101 municipal schools in Greater Bombay, the virtual institutionalization of low standards of language teaching is socially catastrophic. Unfortunately, civic schools unlike private ones, cannot attract the best teachers, or offer the same level and quality of instruction. The fact that the Ford Foundation has given four hundred thousand dollars for it, gives an idea of the colossal expense that a minimum programme of this kind entails. The language project seeks to break new ground in the teaching of languages. It envisages teaching the mother tongue and other languages, including English, in such a way as to emphasize everyday use rather than its literary qualities.

### World Yoga Teachers' Meet

The International Yoga Teachers' Association will hold its Fifth Congress from 20 to 29 December 1976, in Panchagani (Dist. Satara). The Union Health Minister, Dr. Karan Singh, will inaugurate the Congress which is likely to be attended by Governor, Shri Ali Yavar Jung and Chief Minister, Shri S. B. Chavan. The Vice-President of the International Yoga Teachers' Association, Mrs. Maria Helena de Bastos Freire, who hails from Brazil, said that the main object of the forthcoming Congress is to adopt an integrated approach to Yoga and encourage the teaching of Yoga all over the world. The programme for the nine-day Congress consists of lectures and

demonstrations on Yogasanas, evaluation of meditation techniques, Yoga Chikitsa, Yoga Nidra, Kaya-Kalpa, western relaxation techniques, Kriya Yoga, etc.

### Programmes of the Indian Institute of Education

The Indian Institute of Education, which was established in 1948, is going to be revitalized. The Institute now has a full-time Hon. Director, Dr. Chitra Naik who recently retired as Director of Education, Maharashtra. Dr. Naik proposes to develop a series of policy studies and programmes around one principal focus—the reconstruction of education in India in a manner which will help the transformation of the traditional and hierarchical Indian society on the basis of values of equality, freedom, justice and the dignity of the individual. The institute will not run any programmes of formal education but will concentrate on non-formal education (both within and without the system) and the development of alternatives to it. In view of the constraint on resources, both human and financial, the institute will emphasize only those aspects of study which are significant, but comparatively neglected at present.

The proposed activities of the Indian Institute of Education will be developed under five main divisions :

1. Educational Philosophy
2. Non-formal Education
3. Comparative Education
4. Experimentation and Innovation
5. Educational planning and administration

In addition, there will be two services divisions .

1. Consultancy and Training.
2. Publications.

A major research programme, including doctoral work is proposed to be developed in all divisions.

The activities of the Institute will be conducted on both the state and national levels. Membership of the Institute will be open to the states. Tamil Nadu and Karnataka have already been enrolled as members of the Institute. Poona will be the Headquarters of the Institute, which will have branch offices in Bombay and New Delhi. The Institute proposes to collect, over the next five years, a fund of Rs 50 lakhs for its programmes.

#### NON-FORMAL EDUCATION PROJECTS

##### Non-Formal Centres

A SCHEME for imparting education on non-formal lines is being operated in the rural areas by the Government of Maharashtra. This scheme covers, at present, the following thirteen districts: (1) Poona, (2) Kolaba, (3) Ahmednagar, (4) Sholapur, (5) Kolhapur, (6) Thana, (7) Jalgaon, (8) Aurangabad, (9) Parabhani, (10) Buldhana, (11) Akola, (12) Amravati and (13) Chandrapur.

Sixty non-formal education centres have been set up in each district and each centre admits 30 adults in the age-group 15 to 25. The course is of two years and each term is of six months' duration. In order to improve implementation of the scheme a few changes have been made in the Grant-in-aid Code and, as a result, each teacher and supervisor is now paid Rs. 40 and Rs. 50 respectively as honorarium. A State-level orientation programme of officials connected with the Project was conducted in Poona in November 1975 and these officials, in their turn, conducted similar course for teachers and supervisors in each of the thirteen

districts. The Government of Maharashtra has issued detailed directives to the officials concerned on the following aspects of the scheme:

- (a) Greater attention should be paid to the working of Zilla Samanvaya Samities.
- (b) Closer collaboration with the Department of Agriculture, agricultural universities in the State and All India Radio should be ensured.
- (c) The work of teachers and supervisors should be constantly supervised and properly guided from time to time.
- (d) Periodic meetings of Block Development Officers and officials of the District should be arranged for exchange of ideas.
- (e) A larger number of women should be admitted to this course.
- (f) Fortnightly publications should help to disseminate information and maintain a regular flow of ideas between the non-formal education centre and the education officer of the Zilla Parishad.
- (g) Regular reports on the activities of these centres are to be sent to the Government of India and the Directorate of Education.

##### Experimental Literacy Scheme

This scheme is to form part of non-formal education activities and will cover the following eleven districts: (1) Ratnagiri, (2) Nasik, (3) Dhulia, (4) Satara, (5) Sangli, (6) Nanded, (7) Bhair, (8) Osmanabad, (9) Yeotmal, (10) Nagpur, (11) Bhandara.

An earlier project (Pirap Scheme) tried out in the Karanja Block of Wardha District in Maharashtra during the years

1974-75 and 1975-76 had proved highly rewarding and the experiences thus gained will now be made use of.

Under the new scheme, each block will run 10 classes and each district will have three such blocks, i.e. a total of 30 classes for each district. Each class will have a minimum of 30 adult trainees—both men and women. Efforts would be made to enrol as large a number of women as possible. The course will have a duration of 6 months.

#### **Programmes in Collaboration with the Government of India**

Aided by the Government of India, another scheme of non-formal education has been implemented in Wardha District during the current year. As a co-partner in this scheme with the Govt. of India,

Maharashtra has introduced a programme along similar lines in Poona District, supported from State Government funds. The success of the Pirep Scheme tried out in Wardha, and the unbounded enthusiasm evoked by the scheme in the rural areas, has encouraged the government to introduce this course on identical lines.

Under this scheme, 100 centres for Non-Formal Education have already been set up in Poona and Wardha districts and these will look after the educational needs of nearly 3000 adults (each centre will enrol 30 adults in the age-group 15-25). The topics/units covered under this scheme in each centre includes (a) Elementary Literacy (75 hours), (b) Education for Life (150 hours), (c) Vocational Skills (125 hours). □



# Annotated Bibliography of Biology Books

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*Biological science is changing profoundly in nature and contents. The transformation has been from the descriptive to experimental, sweeping in all the modern developments in agriculture, medical science, genetics, microbiology and molecular biology. Consequently, the contents of biology books prescribed for the secondary schools have also changed. The unavailability of up to date information regarding the source books for school teachers and students is a big hurdle in the progress of biology education. In India and other developing countries, the secondary school teachers and students are not in a position to know about the recent titles published in various fields of biological sciences. This is an attempt to help the teachers and students. Here is an annotated bibliography of 22 books from various fields of biology.*

## *Fundamental Concepts of Biology (1967)*

G. E. NELSON, G. G. ROBINSON and R. A. BOOLOOTIAN, John Wiley and Sons Inc., New York, pp. 331, Price : \$ 7.50

THE BOOK serves the purpose of a textbook for secondary school students. The book has been written with the two primary objectives: firstly, to help the students to develop an understanding of biological systems through biological concepts and principles and secondly, to provide a foundation of the subject-

matter. The book starts with a fundamental unit on living material and gradually proceeds towards the functioning of biological system. Chapters II and III deal with structural features of living matter whereas Chapters IV-VI describe various metabolic processes of life. Chapters VII-IX describe about the coordination of cellular activities whereas the processes of reproduction and development are described in Chapters X-XIV. The logical consideration of the genetics of individual and popula-

tion is described in Chapters XV-XVIII. The contribution of Darwin and the process of evolution is described in Chapters XIX and XX. The last five chapters deal with organisms, their environments and the relationship between the two. The description of the textbook is appended by an appendix.

*Biology and Its Relation to Mankind* (Asian Ed., 1964)

A. M. WINCHESTER, D. Van Nostrand Company Inc., New York, pp 632, Price . Rs 13 00

THIS BOOK can be used as a reference book by the beginner students of biology. The description is profoundly illustrated with beautiful diagrams. The book includes all the major aspects of biological sciences. The textual material of the book is divided into 54 chapters and starts with an introduction of the subject. Chapters 11-20 deal with plant sciences whereas Chapters 21-46 with animal sciences. Chapters 47-53 provide a general description of genetical and environmental sciences. The last chapter 'The Founder of Biology' narrates the biography of great biologists and their contribution. The text becomes of much utility by the inclusion of glossary and index.

*Biology Teacher's Hand Book* (BSCS, 1963)

JOSEPH J SCHWAB, John Wiley and Sons Inc., New York, pp 585

THIS BOOK is written by an eminent biologist for the teachers of secondary schools. It also stands with equal importance to the students of degree classes.

The book is divided into five sections and eighteen chapters. In the first section the author has tried to elaborate BSCS approach followed in biology teaching. In Section 2 a special kind of teaching material designed to serve the teaching of biology through enquiry has been included. Section 3 provides a brief knowledge of physical sciences and modern biochemical discoveries to the teachers. Sections 4 and 5 provide a detailed information on the materials helpful in day to day teaching of biology.

*Principles of Biology* (1969)

N. D. BUFFALO AND J. B. THIRONEBERRY, Prentice-Hall of India Pvt. Ltd., New Delhi, pp 416, Price . Rs. 12 00

THIS BOOK is meant for the students of secondary classes. The book provides an information on the various 'modern concepts of biology. The material is written in a very simple language and can be easily covered in one academic year. A brief account of the important fundamental principles of biology is included in this work. The text emphasizes the levels of organization and the appearance of emergent properties at successively higher levels, and relates energy transformations to the structure and function of living systems at different levels of organization. The various modern concepts are developed with an historical background. The book is beautified with numerous coloured illustrations.

The book is divided into 12 chapters covering various important aspects of biology. The book starts with an introduction and ends with the complex concept of evolution and role of biology in the welfare of human society.

*The Strategy of Life* (1974)

C. CROBSTEIN, W. H. Ficeman and Co., California

THIS BOOK provides a brief and outstanding description of life in the light of modern biology. It is a mandatory reading for all the would-be and practising biologists, as well as other scientists. The book serves the purpose of an excellent supplementary material for the students in general biology, human biology and on contemporary issues.

The present edition has been updated and expanded, particularly with respect to levels of organization and the evolutionary significance of man. The book is divided into 11 chapters starting from definition and nature of life in the universe and proceeds to the progressing nature of human beings. The last pages of the book is in the form of index

*Biology : A Textbook for Secondary Schools* (1974)

(EDS) P. MAHESHWARI and MANOHAR LAL, National Council of Educational Research and Training, New Delhi, pp 797, Price Rs 16.50

THE BOOK is a recommended text for the students of secondary classes. It is the most popular book in the country. The students can be acquainted with different kinds of organisms, their activities, habits, their tissues and organs by going through it. The general concepts of evolution, ecology, heredity and cell physiology are described in a very simple language. The approach of presentation provides a pedagogical advantage and prevents students from getting lost in the advanced aspects of biology.

The book is divided into seven sections and binded in five volumes, namely, Section 1—Some Basic Facts About Life, Section 2—The Diversity of Plant Life, Section 3—The Diversity of Animal Life, Sections 4 and 5—Plant and Animal Physiology, Self Perpetuation or Reproductions, and Sections 6 and 7—Evolution, Heredity and Adaptation, General.

*College Botany* (1968)

J J FULLER and O TIPPO, Oxford and IBH Publishing Co., New Delhi, pp 993, Price Rs. 16.00

THIS BOOK serves the purpose of a textbook for teachers and students of secondary classes. It stands with equal demand for an introductory course in botany at tertiary level of education. The book also satisfies the general educational needs of non-professional students and provides a considerable material on the economic importance of plants and general principles of biology, such as evolution, ecology, inheritance and reproduction.

The book is divided into five parts accompanied by a glossary of botanical terms and index. The description of various morphological features of plants is provided in Part I whereas the studies of structure, physiology and reproduction of flowering plants in Part II. The classification and diversity of plant kingdom has been narrated in Part III of the book. Part IV deals with geography and distribution of plants in time and space. The last and fifth part is completely devoted to the importance of plants to men

*The Plant Kingdom* (1968)

H C. BOLD, Prentice-Hall of India Pvt Ltd, New Delhi, pp 128, Price Rs 3 00

THIS SMALL book offers a brief, comprehensive account of the structure and reproduction in various groups of plants and the involved biological principles. It is one of the best write-ups for students of plant sciences. The emphasis is on the principles, specially those pertinent to evolution. The properly labelled good illustrations, some of them are new and original, are included in the book.

The book is divided into 8 chapters which provide an account of similarities and the diversity of plants, algae, fungi, bryophytes to angiosperms. A summary of the complete write-up and selected references for further reading constitute an important part of the chapters.

*Behaviour of the Lower Organisms*  
(Indian Ed., 1965)

H.S. JENNINGS, Oxford and IBH Publishing Co, New Delhi, pp 366, Price Rs 12 00

THE BOOK is written with a descriptive and experimental approach and stands as a basic textbook in the field of animal behaviour. The book is meant for the students of secondary classes. It is divided into three major parts, of which the first is dealing with the behaviour of unicellular organisms, second with the behaviour of the lower metazoa and the third provides an analysis of animal behaviour with a detailed discussion of the theories involved. The book constitutes a major work in the history of experimental biology and behaviouristic psychology. The last pages of the book form an index part of the book.

*Animal Diversity* (1970)

E D. HANSON, Prentice-Hall of India Pvt Ltd, New Delhi, pp. 128, Price Rs 3.00

THE BOOK provides an explanatory description of animal diversity in a simple language. The material of the book is organized around the concept of evolution by natural selection. Most of the descriptive material has been summarized with the help of charts to make it more useful. The text material of the book is divided into 15 chapters arranged in four parts. The book starts with the understanding of animal diversity including its problems and proceeds to the description of the role of evolution in animal diversity. Selected references are listed at the end of the text for further reading.

*The Cell* (1970)

C P SWANSON, Prentice-Hall of India Pvt Ltd, New Delhi, pp 160, Price Rs 7.50

THIS is a small book on a big subject, dealing with various aspects of the cell. This book can be used as a textbook by the students of secondary classes. The revised edition has been extensively improved with a greater emphasis on the function of cell organelles in relation to their structures. The book is divided into 10 chapters starting from the cell as a basic unit of life. A brief information about cell division, its role in reproduction and development is also provided.

*Animal Adaptation* (1970)

A.L. BURNETT, Oxford and IBH Publishing Co, New Delhi, pp. 144, Price Rs 5.25

THIS BOOK serves the purpose of a supplementary reader for secondary school

teachers and students. The purpose of this book is to introduce the beginners with various aspects of animal adaptation as well as provide materials for the gifted high school students. The book is divided into four chapters appended by an index. The first three chapters deal with the study of individual in prespective and retrospective method. The last chapter 'Man' describes the adaptation of man to its environment.

*Genetics* (Indian Ed., 1970)

E. ALTERBURG, Oxford & IBH Publishing Co., New Delhi, pp 512, Price Rs 15 00

THE BOOK describes lucidly the principles and concepts of the newly advanced science of genetics. It covers all the aspects of this branch, starting from Mendel's Principles to the genetics of bacteria, viruses and population. A few chapters are devoted to the problems of cytoplasmic inheritance, blood groups, biochemical genetics, heredity and environment of man. The book serves the purpose of a complete guide to the graduate students in the field of genetics. It can be of equal value to the teachers of secondary classes.

*Genetics and Origin of Species* (Indian Ed., 1968)

T. DOBZHANSKY, Oxford and IBH Publishing Co., New Delhi, pp 356, Price : Rs 10 00

It is one of the best books on the subject ever written. It includes the results of many important experiments carried out in the field of genetics. The text provides an upto date discussion of the mechanism of species formation in terms of known facts and theories of genetics.

The book is divided into 10 chapters.

Each one describes a separate aspect in a simple language. The good language of the book attracts even a common man. It stands with equal values for the students of other sciences also. The textual material of the book is appended by an index for the benefit of readers.

*Adaptation* (1963)

B. WALLACE and A. [SRB], Prentice-Hall of India, Pvt., Ltd. New Delhi, pp 128, Price : Rs. 2 10

A GENERAL account of adaptation of living things to their environment and evolution of natural population are given in the book. It imparts the understanding of how the adaptation occurs, with a focus on theories of evolution and biological adaptation in a very simple language.

The book is divided into 10 chapters, covering various fundamental aspects of adaptation, genetic variation in population, individual adaptation and limitation of adaptation. An index is given in the last pages of the book for the readers.

*The Mechanics of Inheritance* (1968)

FRANK STAHL, Prentice-Hall of India Pvt. Ltd., New Delhi, pp. 192, Price : Rs 6 00

THIS BOOK is devoted to the mechanics of inheritance and serves the purpose of a guide book for interested teachers. This book introduces the knowledge of heredity through a discussion of vegetative reproduction in bacteria. An account of duplication, mutation and recombination in the DNA molecule is included. Each chapter is appended with various problems and questions related to the chapter. There are 10 chapters and a few pages of appendix in the book.

The book includes an account of heredity and description of genetic material, structure, duplication, and mutation of DNA. A brief description about the phenomenon of recombination in viruses and bacteria is also given

### *Heredity* (1968)

D M BONNER and S.E. MILLS, Prentice-Hall of India, Pvt Ltd, New Delhi, pp 128, Price Rs. 3 00

THIS BOOK presents the basic principles underlying the transmission of traits and discusses the chemistry of the genetic material. A brief account of mechanics of genetic transmission is also included in the later part of the book. All the genetical principles applicable particularly to the man has also been narrated in simple language.

The book is divided into 10 chapters, which provide an account of hereditary material, gene reactions and its molecular structure. The effect of nuclear explosion on the hereditary characters of animals including man is also described. At the end of the book, selected references for further reading are given.

### *Introduction to Biostatistics* (1973)

R R. SOKAL and F J ROHLF, W H. Freeman and Co., California, pp. 368, Price. \$ 9 50

THIS is an attractive text developed for teachers and students of secondary classes. The material is excellently presented, particularly the computing methods. The text includes the description of suitable teaching materials with examples, which can be used for basic courses. The discussion of statistical theory is kept to mini-

mum but the clarity of drafting influences readers most. The book covers descriptive statistics, hypothesis, testing, analysis of frequencies and non-parametric tests. The book will be useful to the students who desire to have introductory knowledge of biostatistics as well as to those who plan further work in this field. The necessary statistical tables are also given in the book

### *A Textbook of Plant Ecology* (1971)

R S AMBASHI, Students Friends Co., Varanasi, pp 232, Price Rs. 12 50

It is an outstanding textbook which includes various fundamentals of ecology with special reference to the Indian environment. It is useful for the students and teachers of secondary classes. This book is a bold attempt to cover the subject of ecology in its most up-to-date spectrum. It has been proved an useful contribution in our ecological knowledge. The book has been written in a simple language with excellent examples.

The text is divided into nine chapters accompanied by a bibliography and an index. The first two chapters provide an introduction to the subject and terminology. The description of various environmental factors and adaptation of plants has been dealt in chapter three. Chapters four and five narrate the concept of ecology of plant community. Relationship of energy and ecology is described in chapter six whereas chapter seven deals with production ecology. Chapter eight is devoted to the distribution of plants in relation to their ecological factors. The most recent and useful branch of applied ecology is described in the last chapter of the book.

*Man in Nature* (1968)

MARSTON BATES, Prentice-Hall of India Pvt Ltd., New Delhi, pp. 128, Price Rs 3 00

THIS serves the purpose of a reference book for the students and teachers of secondary classes. The write-up provides a bridge between the biological and social sciences and links it with various subjects such as anthropology, psychology, sociology and human geography. The book contains most recent information and provides an up-to-date material with best available illustrations

The book is divided into 45 chapters belonging to 10 parts and covers all the environmental problems related to human beings. The detailed account of the present human races, problem of population, forestry and wild-life management, forms a major part of the book. The list of related books is given under 'Selected Readings'.

*A Textbook of Animal Husbandry*  
(3rd Ed , 1971)

G.C BANERJEE, Oxford and IBH Publishing Co., New Delhi, pp. 600, Price ' Rs 10.00

THIS is a most useful textbook for secondary school and pre-degree teachers and students in the field. The book includes a detailed account of various aspects of animal husbandry. It describes the study of breeds, the process of reproduction and breeding in various animals.

The book also includes an account of poultry, dairy, farm management and artificial insemination. A chapter on animal nutrition has made the book useful even to a common man. The present third edition has a number of modifications over the earlier ones such as inclusion of a new chapter on Swing Husbandry and a detailed study of mammary glands.

*Genetics of Livestock Improvement* (1965)

JOHN F LASLEY, Prentice-Hall of India Pvt. Ltd., New Delhi, pp 434, Price : 10 00

THIS BOOK serves the purpose of a textbook in the field of animal husbandry for the students of secondary classes. The book presents various fundamental aspects of the dairy industry and modern techniques of breeding and management of dairy cattle. This book can be used as a basis for various management decisions and to give a clear understanding of current practices and problems.

The book is divided into 14 chapters starting from the role of dairy cattle in agriculture to the methods of marketing milk and dairy products. A detailed information about artificial insemination, diseases and parasites of dairy cattle and methods of reproduction are also narrated in this book.

S C. JAIN

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# JOURNAL OF INDIAN EDUCATION

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## CONTENTS

### II EDITORIAL

KA NAA SUBRAMANYAM	1	The Teaching of Literature
P.A. KULKARNI	8	Multi-lingual Skill Method in Teaching of Hindi in Non-Hindi Regions
LOKESH KOUL	15	A Study of the Classroom Verbal Behaviour of Popular Teachers
A.G. KHAN	25	What Do You Teach, Sir ?
EZRA POUND	28	Literature . How to Read and How to Teach (EXCERPTS)
R. K. YADAV	32	Poetry in Indian Schools
V. RAGHAVAN	35	The Teaching of Classical Languages
V.S. SIVAMOCHAN, ISRAEL MANSINGH	39	A Diagnostic Study of the Problems of Teaching English in Technical Institutions
SANTO DATTA	41	Illustrations for Supplementary Readers in English
ERIC	48	Papers presented at All India Educational Research Conference
PRAYAG MEHTA	53	Universalization of Elementary Education
SUMA CHITNIS	57	Priorities for Research in Education
B. SHARAN	64	Causes Behind Poor Quality of Scientific Publications and Textbooks (DOCUMENT)

68 EDUCATIONAL NEWS

86 BOOK REVIEWS

---

# Indian Psychology

*A Journal of Classical Ideas and Current Research*

EDITED BY

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(In cooperation with a board of consulting Editors)

*Indian Psychology* is a journal of ideas as well as of hard facts. It provides a forum where the past and the present meet to create a psychology of the future. This international journal is devoted to the discussion of classical ideas concerning the nature of man and current research aimed at their empirical testing and application. It publishes both theoretical papers and empirical reports. The emphasis, however, is on the integration of research and theory. Cross-cultural and inter-disciplinary research and studies to integrate normal, abnormal and paranormal experiences so as to stimulate alternative scientific paradigms and heuristic models for the study of man will be of special interest. While the primary focus of this new journal is on larger issues having bearing on man's total nature, investigations dealing with specific variables will also be considered for publication.

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# Editorial

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*Literature is but language; it is only a rare and amazing miracle by which a man really says what he means*

—G K. CHESTERTON

WITH REGARD to teaching literature to schoolgoing children one could anticipate an endless debate on two points. One pertains to the selection of the teacher who should be considered qualified to teach literature, and the other to the quality and content of the literature syllabi. Whether or not the teaching of literature is desirable is also a point on which there might be conflicting views. We may recall here what Plato said in his *Republic* : literature need not be taught because it leads one to become irrational and susceptible to misinformation. But literature is surely not fable and fables are never to be taken literally. The purposes of teaching literature are to fire the student's imagination, to enhance his appreciation of cultural values, to help him develop his aesthetic sense and to help him acquire the ability to discriminate in the use of words, and thus express himself more effectively. Perhaps this is not all. Literature liberates a man; therefore it can hardly be distinguished from education itself.

In the preparation of teachers of literature, we need two specific improvements. We offer courses in literature but we expect Masters of Arts in literature to teach both literature and language. Perhaps some rethinking on this point is essential. Secondly, while under training, prospective teachers are mostly offered courses in teaching a given language and not its literature. The confusion probably lies in regarding literature and language as indistinguishable, particularly at this stage of education.

A pertinent point has been raised by one of our contributors as to whether we would not be justified in offering a consolidated course in Indian literature at the M.A. level, covering all the major regional languages. This course would hopefully meet a long-standing need. Literature mirrors both the personality of the author and the temper of the society. To that extent the teaching of Indian literature at any level would be welcome.

We present a collection of articles and papers by teacher-educators and some of our teachers of literature, which tell us of their views and suggestions. □

# The Teaching of Literature

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KA NAA SUBRAMANYAM

LITERATURE is an all-inclusive discipline and it is taught in our schools as if it were an all-exclusive one.

By 'all-inclusive' I mean that nothing that is of human interest and use can be left out in literature. Economics, sociology, politics, history, science, anthropology, mythology, astronomy as well as astrology form a part, though not an exclusive part, of literature. The whole field of human activity is brought into it. But as taught in our schools and especially in our seats of higher learning, literature becomes somewhat of an one-sided thing, a pitiable thing of shreds and patches, excluding this and that and the other. The courses of study exclude even other parts of the literature available so that he who reads Shelley and Keats in

English literature in college is hardly aware of Dryden and Pope and much less of the metaphysical poets. He who reads the nineteenth century English novel is hardly aware that the nineteenth century existed also in France, in Russia, in Norway, in Sweden, in Latin America, in India, in China, in Japan. The British universities from which we inherit a part of our curricula managed to be insular, closing their eyes to other achievement in the world. That was a part of the imperialist structure of education and we don't seem to have got out of it yet.

This insularity, like most things inherited from the British, goes a little further in the case of India. Thirty years after independence our English literature courses are designed to shut out not only

the study of literature, but also the interest in other language literatures. What obtains is that if a student, really interested in literature, acquires an interest in it and insights, he does it out of the classroom, escaping the influence of his teachers. He reads Dostoevski and Selma Lagerlof on his own, without any reference to what he is learning in the classroom.

In a roomful of seminarists at Simla, consisting of more than a score of teachers of English literature, I asked a question. Most of them had read *Principles of Literary Criticism* by I.A. Richards and many of them were not above swearing by it. But I.A. Richards mentions in one chapter a Swedish novel, *Gosta Berlings Saga*.\* He does not mention the author's name. I asked the seminarists whether any of them had sought out the name of the author from other sources. Not one had. It was obvious that though they respected I.A. Richards, not one of them was interested in seeking out the book and reading it. And they rather tended to be proud of it.

I can add other instances of exclusiveness from my own experience. In the early thirties when I had finished college, a student from my village was in the final year of the literature honours course and was being taught by some of the best teachers of literature, or so their reputation said. Now, in the thirties, the metaphysical poets were not yet discovered in India. Dryden and Pope, if they were

known, were not considered a patch on Shelley and Keats. The student's own passion was Keats and later during his Oxford years, he added something to the study of Keats—at least a note in *Times Literary Supplement* on his thesis informs me so. I was a student of chemistry, but being interested in literature I had discovered some modern English poets—T.S. Eliot and Ezra Pound. I tried a student of literature with *Selected Poems of Ezra Pound*, but he was certainly not able to discern anything in it. Nor was he interested in Eliot, though twenty years later, having become a teacher of literature himself, he had to spout all the known things about Eliot to his classes.

In my college we had a course in modern English poetry which included a poem by John Drinkwater and another by T. Sturge Moore which somewhat exaggeratedly proclaimed the pleasures of wine. Our teacher was equally ignorant of modern English poetry and wines; he taught us Sturge Moore, calling him Drink-wine in contrast to the Drink-water we had already done. The name sticks in my mind forty years after, though the title of the poem of Sturge Moore has escaped.

Now, part of the study of English literature in India was overshadowed by the study of Shakespeare. But the study of Shakespeare was quite exclusive in the sense I mean. You studied a play of Shakespeare in the intermediate classes (two years) and two more plays in your B.A. general English. If you took up the English honours course you read four or five Shakespeare plays, either the tragedies, or the comedies, not the histories (strange division for a universal playwright), and hardly anything out of the prescribed texts. This is evidently not

\* It may not be clear to the readers that the author of the said classic is Selma Lagerlof, mentioned in the preceding paragraph.

*Gosta Berlings Saga* was published by Swedish novelist and short story writer Selma Lagerlof in 1891. Lagerlof (1858-1940), who belongs to the neo-romantic tradition in Swedish letters, received the Nobel Prize for literature in 1909.

how Shakespeare should be studied. Precocious students might have gone on to the *Rape of Lucrece* which forms a part of the complete works of Shakespeare, but they seldom went on to the sonnets, even if they were homosexually inclined, which many of the students of my time—as well as of this time—are. Shakespeare as a whole is a complete text; specialization in parts of this text gives only a partial view at best.

I mention this aspect of the study of English literature as it is the pattern we have fallen into, and it affects our reading of other literatures, Sanskrit, Tamil, and other non-classical languages in India. The exclusiveness of the courses militates against our getting a whole view of literature, offering us a truncated view as a substitute.

Another aspect of the teaching of literature in India today that I would like to emphasize is the aspect of the non-critical approaches which prevail.

Both the study of literature and the teaching of it are, properly considered, critical activities. But in India both teachers and students lack a critical tradition and mind and insist on distant evaluations and summings-up that are not pertinent to us.

I have come across professors and lecturers of English literature who can be voluble about writers like Hemingway or Faulkner or Eliot or Yeats about whom three hundred critical opinions have been offered, but in the presence of a new text by a novelist or poet they are stumped, not being able to say why this is good or bad. The development of critical insight not only into texts but also into moral, metaphysical and spiritual problems is of primary importance in the study of literature. It is in this that students of literature in India are

found most wanting.

The Indian tradition does not call for a re-evaluation of reputation with each passing generation. Kalidasa, Bhavabhuti, Asvaghosha, Rabindranath Tagore have reputations that are firmly established. They are not re-evaluated in the context of each new generation. The academic study of literature in India hardly, if ever, leads to a critical, questioning attitude to accepted opinions.

*Make it New* was the impressive title of a book of Ezra Pound in the thirties; he was addressing the poets of his time. But the teachers of literature in India have nothing new to offer us. In their courses on American literature they specialize in Hemingway or Saul Bellow and sometimes Walt Whitman, mainly because these are the fashionable writers. But if you suggest to these American literature specialists that Jack London or William Saroyan might be more important, they will not be convinced, nor will they read them. Talking to one of them, I said I knew and had forgotten more about American literature than he would ever know. He was merely put out. When I went on to talk of the three *At the Breakfast Table* books by Oliver Wendell Holmes he was nonplussed, but he claimed that Holmes was not an American writer—none of his textbooks mentioned him.

I remember one occasion when a professor, said to be an authority on John Keats, was scheduled to speak. A rather mischievous student of his class, bright and quite well up in his Keats, spoke before the professor, so that the professor, rising to speak, had nothing left to say. He took it out on the student by telling him that he would not be promoted. The student was not promoted and the professor kept his reputation as a

great scholar of Keats

I might have given the impression that I dislike Keats, but that is not the case I love him as much as any other English poet, but John Keats comes in handy because at the time I grew up the study of Keats was considered the right thing. An exception to this fraternity of English professors was a Maharashtrian professor who had been a student of Arthur Quiller-Couch, K. M. Khadye by name. He was a Maharashtrian who did not have an Oxford or a Cambridge accent, and said 'ujually' and 'cajually' like any other Maharashtrian. But he taught us *Hamlet* in a way that warmed our hearts. He said, "Let me read it with you and find out what this, the greatest of poets, has to say—if he does have anything to say." We learnt more in his classes than in the classes of more reputed professors of English.

But this is a digression—a tribute to a professor. But the theme I wanted to develop was the lack of the development of critical opinion in our literature classes. The reputation of an author and the impact he has on his readers are not constant in all generations. T. S. Eliot, after laying down the law on many authors in his day, and after being accepted both by academic and creative writers, confessed at the end of his life that critical attitudes could never be absolute, nor could the final word be said on any writer for all time. This is part of the critical attitude itself, which allows for changes of impact and importance. I wonder if any teacher of literature in India is bold enough to assert this and make it a part of his teaching. At best he will dismiss fluctuations in reputation as in fashion; at worst he will ignore them.

A man's critical judgment should en-

able him to recognise a new masterpiece. In this again the teachers of English literature, followed by the teachers of other literatures, have failed; so that in most of modern Indian literature, a chaotic critical situation prevails. The development of valid critical criteria has been neglected to such a great extent in the Indian literary scene that we have no idea of what the masterpieces in a given language are. In this context, the assumption that the widely read books are good literature, on which assumption both the Sahitya Akademi and the National Book Trust have been proceeding on their interregional translation and *aadaan pradaan* schemes, seems to be the only accepted criterion. But literary history would seem to controvert this all-too-easy criterion; often the best-known and the most popular books are not the best. When courses in the modern Indian literature of a region follow the same procedure, offering as literature what is at best successful journalism, the wrong standards for literary study are set.

I have tried the experiment of giving to successful and renowned English professors a book which is indubitably a masterpiece in Tamil. In one case I found that a professor who could hold forth on T. S. Eliot and James Joyce and William Faulkner for hours, had no opinions to offer on the book in hand. I had to ask him questions as to what might be his opinion on the book, thus helping him to make up his mind. In another case the professor left his teenage daughter, who had read the book, to form his opinion for him.

This is a sorry state of things. And for this state of things, teachers of literature who have not striven to inculcate in the minds of their students a critical



approach to what they read are largely responsible. A study of critical criteria should be a part of the teaching of literature.

What passes for literary criticism in our academic circles is hardly literary criticism. What this man says or that is simply repeated. Evolving an idea or theme or vocabulary from what obtains here and now is never attempted.

It might appear that I have been singling out the teachers of English literature for adverse comment. It is not so. The teachers of Indian literature (though our universities and seats of so-called higher learning have yet to evolve courses on teaching Indian literature) are no better.

Tamil or Sanskrit or Bengali or Marathi scholarship still follows the traditional pattern—with the emphasis on memory, not on quality. Exclusiveness and noncritical attitudes flourish when the test of memory is applied in preference to other tests in literature. Most of the scholars in the Indian languages can be relied on to tell you what is contained in which author and to find out where we can get such and such a reference, but they hardly serve as critical guides to the books they claim familiarity with. A Sanskrit scholar, a friend of mine, is a veritable walking catalogue; what he does not know about Sanskrit books is not worth knowing, but he is hardly a guide to my reading. If I were to ask him for a reading list he would recommend the most worthless books. In the case of Tamil scholars, I find that they have to unlearn a lot of things that they have learnt in school and college. It is not easy to unlearn what you have learnt over the years. In course of time you acquire vested interests in your learning and go on perpetuating the errors of an earlier day. I suppose this

is true of the teachers of Hindi literature and other literatures as well.

If we study Shakespeare solely in the light of what the eighteenth and nineteenth century German scholars said of him, people would laugh. But in the case of Sanskrit and Tamil, the two classical languages of India, we fail to see the absurdity of the position when we insist on studying the texts only in the light of the commentators who lived hundreds of years, in some cases a thousand years after the poets or the original authors. In Tamil, the so-called Sangam poems (by the way, Sangam is itself a misnomer because there were no Sangams which legend has perpetuated, and the professors have refused to unlearn what they learned) are studied only in the context of what their commentators offer us. When the great scholar Dr. U.V. Swaminatha Iyer discovered an ancient Sangam text without any available commentary, he set about providing a commentary which might have been written in the 12th century. An admirable feat of scholarship no doubt, but not one wholly worthwhile or necessary or even valid. For in the teaching of literature the commentators should not be given undue prominence—though they should be studied as they were learned men. Poets should be studied as poets. In a century of the teaching of Tamil literature this has not been done.

The teaching of literature and its history, to be effective, must proceed from the present to the past; this is the normal course. But academics insist on doing it the other way—from the past to the present, which is an unnatural reversion of order, upsetting values both in life and in literature. But the great handicap is that lacking literary criteria and having no tradition of criticism, we choose the

wrong point to look back from. The teachers of Tamil literature should have been the first to acknowledge the attempts at new verse in Tamil if their love for Sangam poetry was genuine. For the new verse movement seeks to do just what Sangam literature did in protest against the then accepted ideas of literature. But the teachers of Tamil literature, all except a few, are wholly against it and ignore it.

I have so far been negative in my approach to the teaching of literature as it obtains in English and the Indian languages today. Let me try to give some idea of what would amount to good and effective teaching of literature in India.

First of all, it is necessary to have a course of study in Indian literature, defining our own classics of the remote and the recent past. This is necessary at an elementary level if we want to have a usable past in Indian literature which would help study and creative activity.

As critical prelude we should perhaps make a thorough study of the development of literary criticism in India, mainly in Sanskrit, and the conditions under which it developed up to a point, died and what seems a natural death. I personally think that the death of literary criticism and literary creation was natural in Sanskrit when the teachers of literature assumed for themselves as much importance as the critics and the creators themselves.

Having established this body of critical theory, we should be able to draw conclusions as to the purpose of literature and the criteria of prose and poetry, with a vocabulary of our own instead of depending on European, English or American vocabularies that often do not suit our time and place. This critical

vocabulary should be drawn up with reference to our own masterpieces of the past and the present in whatever language written.

The want of texts is there of course. While every nation in the world can boast of a library of its national literature, we do not as yet have a library of Indian literature comprising of three hundred or five hundred or a thousand volumes in translation. As it happens, we leave our translations to be done by English or American scholars. Foreign discovery of Indian literature may not be an unmixed blessing. In Japan they are already experiencing the discomfort of American discoveries of Japanese masterpieces. Something like that has already happened in India. The editor of a popular weekly in English goes so far as to say that as Prem Chand had no impact on foreign readers and a translation of his novel could not be published abroad, he was not a good writer. I have my own reservations about Prem Chand, but not for the reason given. This could only happen in a country where teachers of literature have not done their job properly.

With all these faults there should be in every university a department of Indian literature—for national pride, if for no other reason. This department might undertake translations from local and other regional languages. It should not be a department which is singular—Bengali, Marathi, Hindi—but composite, trying to bring under its survey all the languages of India. He who knows only Bengali is not a good Bengali scholar. He should have facilities to acquire knowledge of other literatures.

And it is time we did away with our English literature, American literature and Commonwealth literature depart-

ments, though I realize that it would throw out of jobs most of our teachers of literature. There can be courses in foreign literatures but they should be wholly subordinated to Indian literature courses

These seem to be some of the things to be taken up immediately if we want our teaching of literature to be effective and productive

When forty years ago I was invited to join a literature course in English I told a professor of English who had a great

reputation at the time: "No. I would prefer to keep my love of literature for my life. I don't want to study literature as an academic discipline."

Literature, unlike the disciplines of technology and science, is personal, it is the personal element in teaching literature that makes it difficult as an academic discipline. The purpose of teaching literature should be to develop a student's critical judgment and to train him for a lifelong love of literature. Current teaching of literature fails in both respects, as I see it. □

# Multi-Lingual Skill Method in Teaching of Hindi in Non-Hindi Regions

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## *1.0 Introduction*

More than 25 years have passed since Hindi acquired the status of the national language of India. Hindi has been taught in the various States for a still longer period. However, a person from a non-Hindi region finds it difficult to express himself in Hindi. A few correct sentences, and he is at a loss for appropriate words and suitable sentence constructions. His speech does not sound sweet to the ear because of bad pronunciation.

There are many reasons for this. People in non-Hindi regions do not get enough opportunity to hear and speak Hindi. The limitations and drawbacks in the methods of teaching Hindi through the school curriculum remain

In order to remove these drawbacks, I

have made a hypothesis of a new method of teaching Hindi and have also made some experiments on behalf of the Educational Research Association, Kolhapur. I introduce this new method, which I found useful, on the basis of the conclusions drawn from my experiments.

## *2.0 Title*

This method is based on the oral approach in teaching a foreign language, further developed into the multi-lingual skill approach. At present the method is used in teaching English as a foreign language. It is possible to use the same method with some modifications for the teaching of Hindi in non-Hindi regions. I have made my experiments on the basis of the above-mentioned principle, and

therefore my method is named the Multi-Lingual Skill Method.

### 3.0 Nature of the Multi-Lingual Skill Method

In this method more importance has been given to listening and speaking. Reading and writing have also not been ignored. Opportunities have been offer-

ed for listening, speaking, reading and writing in every period of 35 minutes. Apart from sentence structures, other grammatical stumbling blocks such as tenses have also been taken into account. Consequently, the curriculum prepared for this method will prove all-inclusive. I am giving below a lesson plan to exemplify the nature of this method.

### 3.1 Model Lesson Plan

अध्यापन घटक—पूर्ण भूतकाल

आवृत्ति घटक—सीधा भूतकाल

पाठ सीढ़ियाँ	अध्ययन प्रसंग
१. आवृत्ति	<p><b>सीधा भूतकाल</b></p> <p><b>प्रसंग १—</b></p> <p>शिक्षक एक छात्र को बुलाते हैं। उसे फलक पर नाम लिखने के लिए कहते हैं। छात्र नाम लिखता है। छात्र अपनी जगह पर जाता है।</p> <p>शिक्षक—‘सुरेश ने फलक पर नाम लिखा।’</p> <p>दो-तीन छात्रों से व्यक्तिगत दुहरावट के लिए शिक्षक कहते हैं। बाद में सामूहिक दुहरावट।</p> <p><b>प्रसंग २—</b></p> <p>शिक्षक दूसरे छात्र को बुलाते हैं। उसे दरवाजा खोलने के लिए कहते हैं। छात्र दरवाजा खोलता है। अपनी जगह पर जाकर बैठता है।</p> <p>शिक्षक—‘गोपाल ने दरवाजा खोला।’ ऊपरी तरह व्यक्तिगत तथा सामूहिक दुहरावट।</p>
२. प्रतिपादन	<p><b>पूर्ण भूतकाल</b></p> <p><b>प्रसंग ३—</b></p> <p>शिक्षक एक छात्र को बुलाकर दरवाजा बंद करने के लिए कहते हैं। छात्र दरवाजा बंद करता है।</p> <p>शिक्षक—‘बच्चों सुनो। माधव ने दरवाजा बंद किया उसके पहले गोपाल ने दरवाजा खोला था। फिर से सुनो..... मेरे कहने के बाद कहो।’ शिक्षक वह वाक्य दुहराते हैं।</p> <p>सभी छात्र उनके बाद दुहराते हैं।.....व्यक्तिगत दुहरावट।</p>

प्रसंग ४—

शिक्षक—‘सुरेश अपनी बड़ी लेकर आओ। उसमें लिखा हुआ पढ़ो।’ सुरेश पढ़कर जगह पर जाकर बैठना है।

शिक्षक—‘बच्चों मुनो। सुरेश ने पढ़ने बड़ी पर लिखा था, बाद में यहाँ आकर पढ़ा।’ ऊपरी तरह दुहरावट।

प्रसंग ५—

शिक्षक—‘कल शाम मैं मोहन के घर गया था, लेकिन मोहन घर में सोया था।’ छात्रों से सामूहिक तथा व्यक्तिगत रूप में दुहरावट।

३. सराव

वाक्यविधा सराव (Pattern practice)

शिक्षक निम्नलिखित वाक्य फलक पर लिखते हैं।

मोहन घर में सोया था।

शिक्षक छात्रों को प्रादेशिक भाषा में सूचना देते हैं।

‘मैं तुम्हें एक शब्द सागेन त्याचा उपयोग करील वाक्यात करून त्यानुसार होणारे बदल करून वाक्य पुन्हा म्हणा।’

शिक्षक—‘कमरा।’

सब छात्र—‘मोहन कमरे में सोया था।’

शिक्षक—‘मीना।’

सभी छात्र—‘मीना कमरे में सोई थी।’

शिक्षक—‘पत्र लिखना।’

सभी छात्र—मीना ने पत्र लिखा था।

४. पठन

तालिका (Substitution Table)

माधव	—	किताब	लिखा	था	—
मीना		दरवाजा	खोला		
मैं	ने	सपना	पढ़ा		
गणेश		पत्र	देखा	थी	
		बस्ता	लिया		

५. लेखन

‘ऊपरी तालिका से पाँच अर्थपूर्ण वाक्य अपनी बही पर लिखो।’

— शिक्षक के द्वारा सूचना

६. स्वाध्याय

ऊपरी तालिका से १५ अर्थपूर्ण वाक्य बनाकर लाओ।

### 3.2 Stages of Lesson

#### 3.21 Revision

The teacher revises the necessary language items, such as structures, at this stage. This revision can be done by various methods of drilling such as individual drilling, chorus drilling, group drilling, use of flash cards, call-word practice, use of questions, pattern practice etc

#### 3.22 Presentation

At this stage, the teacher creates different situations to teach each new language item. He provides ample opportunities for listening and speaking.

#### 3.23 Practice

The teacher gives sufficient scope to the students for practising the new language items taught in the presentation stage as per methods mentioned in Para 3.21.

#### 3.24 Reading

Flash cards, substitution tables, black-board and textbook lessons are used.

#### 3.25 Writing

Writing can be done with the help of aids used for reading.

#### 3.26 Assignments

Assignments are given for the practice of new items taught.

There is no rigidity in following these steps. The steps of the lesson plan will be according to the demands of the items taught. There is freedom for the teacher to omit a stage.

### 3.3 Multi-Lingual Skills:

#### 3.31 Listening

The teacher is expected to consider the phonemes, stresses, pitches, tones and intonation. He should give enough opportunity to his students to listen to the language spoken. Mistakes in pronunciation

should be corrected. The teacher is expected to have studied Hindi phonetics.

#### 3.32 Speaking

One cannot speak unless one gets the opportunity to speak. Accurate pronunciation, proper stress and intonation are important. This method provides ample opportunities for the development of the habit of thinking in the language in which one is expected to speak.

#### 3.33 Reading

Reading has been given importance in this method. Reading aloud as well as silent reading have been included. At first the students should be asked to repeat after the teacher and then to read by themselves. The textbooks are to be used for reading. They are to be read and understood by the student himself. At the same time, the various language items, flash cards and substitution tables can be used as reading material.

#### 3.34 Writing

The language items taught at the presentation stage should be used for reading and writing. The writing work is based on the questions which are asked orally at the reading stage.

#### 3.4 Practice Aids

Practice aids such as individual, chorus and group drilling methods are well known. I am explaining below only the new methods.

#### 3.41 Call-word Drill

The teacher reads a sentence. The students repeat it. Then the teacher speaks only a word each time and the students go on making similar sentences.

Teacher—	किताब मेज पर है ।
Students—	किताब मेज पर है ।
Teacher—	गेंद ।

Students— गेंद मेज पर है ।  
 Teacher— कलम ।  
 Students— कलम मेज पर है ।

### 3.42 Object Drill

The teacher shows an object and makes a sentence using the word for it. The students repeat the sentence. The teacher shows the object again and the students recall the word for it and make a sentence using it.

Teacher — (Shows a ball) यह गेंद है ।  
 Students — यह गेंद है ।

Object shown by the teacher	Sentence made by the students
a flower	वह फूल है ।
a book	वह किताब है ।

### 3.43 Pattern Practice

The students repeat a sentence after the teacher. The teacher may write it on the blackboard. Then he suggests another word. The students use the word and make the necessary changes in the sentence. An example is given in the practice stage of the lesson plan.

### 3.5 Assignment

Different types of home work are given for the practice of the new structural items and use of grammatical principles e.g. substitution tables for making sentences, fill-in-the-blanks, and questions based on textbook lessons discussed in the classroom orally.

### 4.0 Principles and special features

The method follows the following principles.

(a) A child picks up a language from his surroundings. This principle is followed in this method. Therefore it is neces-

sary to create a proper atmosphere in the classroom.

(b) Though Hindi is used as the medium of instruction, use of the mother tongue is not forbidden. This method accepts the necessity of giving formal instruction in Marathi first. The same is repeated in Hindi in order to make the student acquainted with the language. This procedure may be discontinued after the students become familiar with the use of Hindi. Words like यह 'वह' may be translated, if necessary, once in a lesson, but translating each sentence should necessarily be avoided.

(c) Language is learnt by its use. Ample opportunity of using the language is offered to the students in this method.

(d) Language-learning is a habit-forming process. If the language is taught through situations, students get the opportunity of using the language.

(e) Language is learnt by imitation. In this method the teacher uses new structures and new words and the students repeat after him. He pays attention to the phonetic aspect of the language. Through chorus and individual drilling, they get opportunities for imitation.

(f) This method follows the principles of the oral approach in language teaching i.e. (i) listening before speaking (ii) reading before writing.

(g) Language-learning means acquiring skills in listening, speaking, reading and writing. This is the basic principle of this method. The stages of the traditional lesson plan are done away with. Another feature is that these stages are not rigid ones. The teacher is free to omit or add to the stages. However, he should be able to defend the changes made by him.

(h) In this method, the principle of 'play' is used. In such activities as repeating after the teacher, reading and wri-



ting, students are more active than the teacher.

(i) Though importance is given to the teaching of sentence structures, study of grammar is not altogether ignored. Instead of teaching grammar by the rote, importance is given to language practice. Emphasis is laid on descriptive grammar instead of prescriptive grammar.

(j) A salient feature of this method is the use of controlled and graded vocabulary and structures. When the teacher presents a new structure he uses known vocabulary; when he presents new words, he uses known structures. Practice is given to the students to ask questions

#### 5.0 *Difference from the Traditional Methods*

There are four methods of teaching Hindi in a non-Hindi region.

- (a) Grammar and Translation Method
- (b) Direct Method
- (c) West Method
- (d) Structure Method.

In this new method all the useful principles of these methods have been incorporated and a few new principles added. The importance of grammar in the grammar and translation method has been accepted in the new method. However, translation has been avoided. The new method has also accepted the principle of atmosphere from the Direct Method. The new method also takes into consideration the structural base of the Structure Method while giving appropriate importance to grammar, vocabulary and the textbook. The method gives importance to all the four skills of reading, writing, listening and speaking, not just to reading as in the West Method. It has adopted various features such as the oral approach, the multi-lingual skill approach and education through situation. Consequ-

ently, it is an addition to the original four methods of Hindi teaching.

#### 6.0 *Experience through Experiments*

To confirm the hypothesis, some lessons based on this method have been taught to Class V students. Sentence structures, textbook lessons etc. were taught. Findings from the observation are given below.

(a) The difficulties felt by the students while learning through the Direct Method were not experienced while learning through this method. Students were not found to falter while constructing sentences in Hindi. They answered questions without any hesitation. They were generally more confident of their expression in Hindi. A teacher remarked at the end of a lesson, "I did not expect the students to answer so quickly and confidently."

(b) The students who mispronounced certain words started pronouncing them right at the end of the lesson and in the following lessons. About 65 to 72 per cent of students tried to answer the questions. Though some students made mistakes while constructing sentences, it was felt they could be corrected through practice. This speaks in favour of the new method.

#### 7.0 *Difficulties and Solutions*

As the syllabus of Hindi is not based on structures, it is necessary to spot them in the lessons in the textbook. A single lesson might feature a number of sentence structures. Having taught all of them and having explained all the new words, it becomes possible to pay more attention to reading.

With a view to revise the present syllabus a project has been completed on behalf of the Maharashtra State Text Book Bureau and Curriculum Research Committee, Poona. This project was

undertaken by Prof. R. T. Bhagat from Kolhapur and the suggestions made by him regarding the order of sentence structures for Class V are very useful. Therefore, the present difficulty is likely to be solved soon. The introduction of this new method has special importance because it has been suggested before the introduction of changes in the present curriculum of Hindi.

#### 80 New Opportunities for Research

This research project offers opportunities to explore new fields of research such as :

- (a) Rewriting of textbooks.
- (b) Preparation of substitution tables.
- (c) Collection of passages for comprehension based on structures and graded

vocabulary.

(d) Projects for the first step in reading and writing Hindi.

#### 90 Conclusion

In Maharashtra, learning Hindi is not difficult because of the use of the Devnagri script. In other States where Devnagri is not used the present method would prove useful as it makes use of flash cards. Teachers especially trained to teach Hindi through this method will be necessary if it is to be introduced. In this connection, Prof. R. T. Bhagat has made a recommendation that there should be a State Institute of Hindi as there is State Institute of English. This recommendation is quite reasonable and should be considered seriously.

#### REFERENCES

- |                       |  |
|-----------------------|--|
| 1. श्री केणी-कुलकर्णी | हिन्दी की अध्यापन पद्धति ।   |
| 2. डॉ० भोलानाथ तिवारी | भाषा विज्ञान ।   |
| 3. श्री भगन रा० तु०   | महाराष्ट्र राज्य पाठ्यपुस्तक निर्मिति मंडलाच्या पाचवीच्या हिन्दी पाठ्य पुस्तकांतील स्तरित वाक्यव्यवस्था व शब्द-संग्रह या बाबत संशोधनात्मक प्रश्न । |
| 4. श्री साठे ग० न०    | राष्ट्रभाषा का अध्यापन ।   |
| 5. Billows, F. L.,    | The Techniques of Language Teaching.   |
| 6. Bhandari, C. S.,   | Drills and Exercises in English Book   |
| Kinky, V. A.,         | I, II, III.  |
| Ram, S. K.,           |  |
| 7. Horby, A. S.,      | The Teaching of Structural words and Sentences Pattern Stage I & II.   |
| 8. Gurvey, P.,        | The Teaching of English as a Foreign Language.   |
| 9. Menen, T. K. N.,   | The Teaching of English as a Foreign Language. □   |

# A Study of the Classroom Verbal Behaviour of Popular Teachers

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*This study was undertaken to explore the patterns of classroom verbal behaviour of popular teachers that differentiate them from the unpopular ones. Flanders' ten category system of observation was used. The sample consisted of 14 popular and 14 unpopular male teachers teaching English to various classes. All the teachers were trained and their teaching experience ranged from three to eight years. Every teacher was observed for two spells of 30 minutes each. Separate matrices were prepared for each teacher. Finally 'master' and 'percentage' matrices were obtained for the two groups of teachers. The results indicate that popular teachers differ significantly from the unpopular ones in that they praise and encourage the students, accept and clarify their ideas, and put more questions to them. The popular teachers also showed more flexibility in communication and put more emphasis on the subject matter.*

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CANE (1967) points out the difficulties inherent in attempts to define the concept of a 'good teacher' and mentions the lack of common criteria employed by even the most experienced observers. Researches in teaching effectiveness are extensive and numerous (Domas and Tiedman, 1950; Barr *et al.*, 1953; Barr 1961; Gage, 1963; Evans, 1961; Medley and Mitzel, 1958) and the difficulties involved are notorious

(Davis and Satterly, 1969). Bibliographies dealing with work in the field of teacher effectiveness show that there is unanimity about the criteria of teacher success or effectiveness (Monroe, 1952; Harris, 1960; Ebel, 1969). But the 'popularity' of a teacher among his students seems to provide a good indirect measure of his effectiveness. Alexander and Halverson (1957) state that "it seems a fair

assumption that teachers whom learners like best are those who have the best interaction with pupils and therefore the potentiality for greater success in teaching" (p. 30). This assumption is supported by the findings of Hart (1934), Coats *et al* (1972) and Koul (1972). Studies show that the subjects taught by well-liked teachers are voluntarily continued by students, while subjects taught by disliked teachers are continued only if they are required (Morse and Wingo, 1968).

There have been repeated attempts to relate personality variables to teacher popularity and to identify those personality characteristics which differentiate popular and unpopular teachers. In the earlier studies conducted by Hart (1934), Jersild (1940), Crow and Crow (1948), and Richey and Fox (1948), it was directly elicited from pupils that they liked teachers who were cooperative, democratic, considerate, patient, who had wide interests, the ability to explain lessons clearly, fairness in grading, and pleasing manners. Koul (1973) found popular teachers higher on the factors A, B, C, G, H, N and Q<sub>1</sub> and lower on the factors F, I, O and Q<sub>2</sub> of Cattell's 16 PF test; and all such teachers were characterized as more outgoing, intelligent, emotionally stable, sober, conscientious, venturesome, tough-minded, shrewd, placid, controlled and relaxed than the teachers who were unpopular among their pupils. Only four Sprangerian values—*theoretical*, *social*, *political*, *religious*—and seven Murray's needs, *n achievement*, *n dominance*, *n order*, *n endurance*, *n exhibition*, *n affiliation* and *n nurturance* were found to be the dominant values and needs of well liked teachers in other studies (Koul, 1973 a, 1974). Besides the variables mentioned above, an equally important contribution to teacher popularity

comes from the teacher's classroom behaviour. As Webb (1971) puts it, "The way a teacher behaves, not not what he knows, may be the most important issue in the transmission of the teaching-learning exchange."

### THE PRESENT STUDY

The pupil's behaviour is affected to a great extent by the type of teacher behaviour exhibited in the classroom. Earlier researches have shown that the teacher's classroom behaviour generally decides what is called the 'classroom climate' (Haggeity, 1932, Brookover, 1940, Bush, 1942). Flanders (1960) states: "Teacher's classroom behaviour in particular exerts a crucial influence on the pupils" (pp. 180-217). It is more true in the case of a teacher who is not liked and admired by his pupils (Martin and Stendler, 1953). The classroom behaviour of popular teachers has a formative influence on the social, emotional, moral and mental development of the pupils (Morse and Wingo, 1968). Thus the classroom behaviour of popular teachers that differentiates them from unpopular ones must be studied. A number of studies on the classroom verbal behaviour of teachers teaching different subjects have been conducted in India and abroad (Flanders, 1965, Amidon and Powell, 1967; Bond; 1970; Hough and Ober, 1967; Geffs, *et al*, 1968; Kirk, 1963; Buch and Santhanam, 1970; Buch and Quraishi, 1970; Santhanam, Quraishi and Lulla, 1970; Pareek and Rao, 1970). But no endeavour appears to have been made so far to study the classroom behaviour of popular teachers. The present study was undertaken to explore the patterns of classroom behaviour of popular teachers, as exhibited through the teacher-pupil

verbal interaction, that differentiates them from those not unliked by the pupils.

## METHOD

### *Identification of Popular Teachers*

In common language a person popular in a particular group is one who is admired or liked by persons of the group. A teacher was considered to be 'popular' in a group of students when he was liked by at least 90 per cent of the group. A teacher liked by 10 per cent or less was considered to be 'unpopular'.

Eleven boys' high and higher secondary schools in Haryana were selected at random. The clusters of all the students on rolls of these schools were selected for the study. The students were asked to write down the names of five teachers they liked most on a proforma supplied to them by the investigator. The students were directed not to write down their names or roll numbers on the proformas to enable them to give their frank and sincere opinion. The investigator personally supervised the filling up of the proformas. This was done confidentially and in the absence of any teachers. This helped the students to think freely in the familiar atmosphere of the classroom. The procedure was applied in all the 11 selected schools and the total number of the students who filled the proformas was 5326.

All the proformas were arranged school-wise in 11 piles, each pile representing a school. The proformas in each pile were given a serial number. The number of students who had shown a liking for a particular teacher was recorded by marking tally marks against the name of each teacher. The tallies were totalled for all the teachers school-wise,

for all the 11 schools separately. The total tallies of all the teachers were converted into percentages. The teacher who was liked by 90 per cent students or more was designed 'popular' and the teacher who was liked by 10 per cent students or less 'unpopular'. The total number of popular teachers came to be 32, in which 28 were male and four female. It has been found that the classroom behaviour of male and female teachers, teaching different subjects, differs significantly (Getzels and Jackson, 1963, Buch and Santhanam, 1970; Buch and Quraishi, 1970; Quraishi and Lulla, 1970; Buch and Santhanam, 1971). Hence, it was thought worthwhile to select finally a sample of 14 male teachers, teaching English to various classes, from the group of 32 selected popular teachers. All the 14 teachers were trained and their teaching experience ranged from three to eight years. Similarly, a contrast group of 14 'unpopular' teachers, equivalent with regard to sex, teaching subject and experience, was selected.

### *The Technique*

The interaction analysis technique developed by Flanders (1960, 1970) was used in the investigation. It is an observational technique designed to observe and code classroom verbal behaviour of the teacher every three seconds, using a ten-category system. The system is made up chiefly of three major components—teacher talk, student talk, and silence and/or confusion. The various categories and their description is given in Table 1.

As may be seen from the Table 1, the influence which the teacher uses in the classroom is of two types—'direct' and 'indirect'. The student talk is divided into 'responsive' and self-initiated' parts.

TABLE 1  
FLANDERS INTERACTION ANALYSIS CATEGORIES\*

TEACHER	TALK	RESPONSE	1. Accepts feeling. Accepts and clarifies an attitude or the feeling tone of a pupil in a non-threatening manner. Feeling may be positive or negative; Predicting and recalling feelings are included.
			2. Praises or encourages. Praises or encourages pupil action or behaviour. Jokes that release tension, but not at the expense of another individual; nodding head, or saying "unhm?" or "Go on" are included.
			3. Accepts or uses ideas of pupils. Clarifying, building or developing ideas suggested by a pupil. Teacher extensions of pupil ideas are included but as the teacher brings more of his own ideas into play, shift to category five.
TEACHER	TALK	INITIATION	4. Asks question. Asking a question about content or procedure, based on teacher ideas, with the intent that a pupil will answer.
			5. Lecturing. Giving facts or opinions about content or procedures; expressing his own ideas, giving his own explanation, or citing an authority other than a pupil.
			6. Giving directions. Directions, commands, or orders to which a pupil is expected to comply.
PUPIL	TALK	RESPONSE	7. Criticizing or justifying authority. Statements intended to change pupil behaviour from non-acceptable pattern, bawling some one out, stating why the teacher is doing what he is doing; extreme self-reference.
			8. Pupil-talk response. Talk by pupils in response to teacher. Teacher initiates the content or solicits pupil statement or structures the situation. Freedom to express own ideas is limited.
			9. Pupil-talk-initiations. Talk by pupils which they initiate. Expressing own ideas; initiating a new topic; freedom to develop opinions and a line of thought, like asking thoughtful questions; going beyond the existing structure.
PUPIL	TALK	SILENCE	10. Silence or confusion. Pauses, short periods of silence and periods of confusion in which communication cannot be understood by the observer.

\*Taken from *Analysing Teacher Behaviour* by Ned A. Flanders. Addison-Wesley Publishing Co., 1970

### *Observer Training*

Preceding the observational study, the investigator received comprehensive training in observing teachers in classroom situations. The categories were memorized thoroughly. By the end of the training period the inter-observer reliability, using Scott's co-efficient correlation, was consistently above 75.

### *Collection of Data*

Each teacher was observed twice, for 30 minutes each time, and so the sample for each teacher's classroom behaviour constituted a full hour of classroom interaction. The second observation was made when the teacher took the same class immediately afterwards. The second observation was therefore, in content, a continuation of the first one. The speed of encoding verbal communication was approximately one for every three seconds, and so it was in accordance with the procedures of observation associated with Flanders' scale of ten categories.

### *Data Analysis and Results*

Separate 10 by 10 matrices were prepared for each teacher and for each observation, which yielded 28 matrices for all the 14 'popular' and 28 matrices for all the 14 'unpopular' teachers. Then the two matrices representing the two observations for each teacher were combined and 14 'combined matrices' for each group of 'popular' and 'unpopular' teachers were formed. Finally two 'master matrices', representing the two groups of popular and unpopular teachers, were evolved separately by combining the individual 'combined matrices' for each teacher in each group. The process of combining matrices was carried out by

cell-to-cell addition of frequencies, as suggested by Flanders. The cell frequencies of the two 'master matrices' were converted into percentages to get the 'percentage matrices'.

To find out if the classroom verbal behaviour of the two groups of teachers was different, the interaction patterns of the popular teachers were compared with those of the unpopular ones. For this purpose the percentages of the occurrences of each category and their means, teacher-wise, for the two groups were calculated. The 'Median Test' was applied to test the significance of the differences at .05 level. The results are summarized in Table 2.

From the total tallies, distributed over the cells of the 'master' and 'percentage' matrices, the percentages of 'teacher talk', 'student-talk' and 'silence or confusion' were computed for the groups of popular and unpopular teachers.

The measures I/D and i/d, used to find out the estimates of teachers' direct and indirect influence behaviour patterns, were not calculated in the present study because in many studies these ratios have appeared deceptively high or low. They were, therefore, considered unreliable. Flanders (1970) himself suggested three alternative measures, Teacher Response Ratio (TRR), Teacher Question Ratio (TQR) and Pupil Initiation Ratio (PIR), to describe certain influence patterns. These ratios were calculated with the help of appropriate formulae. The values of Instantaneous Teacher Response Ratio (TRR 8,9), Instantaneous Teacher Question Ratio (TQR 8,9), Content Cross Ratio (CCR), and Steady State Ratio (SSR), were also computed from the cell frequencies of the matrices to aid the interpretations. The results are given in Table 3.

TABLE 2  
MEAN PERCENTAGE OCCURRENCE OF CATEGORIES IN THE POPULAR AND  
UNPOPULAR GROUPS OF TEACHERS

Category	Mean percentage occurrence		Significance
	Popular Teachers	Unpopular Teachers	(Median Test)
<i>Teacher Talk</i>			
1. Accepts feeling	---	---	---
2. Praises and encourages	5.97	0.76	Significant
3. Accepts or uses ideas of students	3.83	1.17	Significant
4. Asks questions	13.04	8.02	Significant
5. Lecturing	40.11	43.27	Not significant
6. Giving directions	3.12	2.92	Not significant
7. Criticizing or justifying authority	0.37	2.76	Significant
<i>Student Talk</i>			
8. Student talk-response	19.02	20.07	Not significant
9. Student talk-initiation	3.18	3.31	Not significant

Significant at .05 level.

TABLE 3  
PERCENTAGE VALUES OF RATIOS FOR POPULAR AND UNPOPULAR TEACHERS

S No.	Variable	Symbol	Popular Teachers	Unpopular Teachers
1	Percent Teacher Talk	(TT)	59.56	67.27
2	Percent Pupil Talk	(PT)	29.45	21.34
3	Percent Silence/confusion	(SC)	10.99	11.39
4	Teacher Response Ratio	(TRR)	65.7	64.9
5	Teacher Question Ratio	(TQR)	24.7	18.7
6	Pupil Initiation Ratio	(PIR)	17.3	17.0
7	Instantaneous Teacher Response Ratio	(TRR 8, 9)	78.9	67.3
8	Instantaneous Teacher Question Ratio	(TQR 8, 9)	44.7	37.4
9	Content Cross Ratio	(CCR)	41	29
10	Steady State Ratio	(SSR)	39	47



## DISCUSSION

Table 3 reveals that the popular teachers talk 29.45 per cent, allowing 29.45 per cent for student talk, which leaves 10.99 per cent for silence or confusion. The unpopular teachers, on the other hand, appear to be more talkative, with 67.27 per cent, since they allow student talk and silence or confusion to go up to 21.34 per cent and 11.39 per cent respectively.

Category I, accepting the feelings of pupils, was found to be completely absent in most of the popular and unpopular teachers. The teacher accepts feelings when he says he understands how children feel, that they have the right to their feelings, and that he will not punish them for their feelings. Also included in this category are statements that recall past feelings, refer to enjoyable or uncomfortable feelings that are present, or predict happy or sad events that will occur in the future. Since the acceptance of these emotions for the groups of both the popular and unpopular teachers was found to be quite rare, it may be said that both the types of teachers ignore the feelings expressed by the pupils and consider the classroom to be a place where people are concerned more with ideas rather than feelings.

Table 2 reveals that the mean percentage occurrence of category-2, praising and encouraging the pupils, was significantly more in the popular teachers. This shows that the popular teachers, on an average, praise or encourage pupil action or behaviour more than their unpopular counterparts. This former may indulge in frequent jokes that release tension but the jokes are not at the expense of another individual.

The popular teachers also showed significantly higher utilization of category-

3, accepting and using the ideas of pupils, as compared to the unpopular teachers. This indicates that popular teachers, on an average, make more use of the ideas of pupils and try to build and develop their discussion on ideas suggested by the pupils themselves.

Table 2 reveals that popular teachers used category-4, putting questions to their students, significantly more than the teachers not popular with their pupils. It may be held, therefore, that popular teachers make frequent use of questions about content or procedure which are based on their own ideas, with the intent that a pupil will answer.

The use of categories 5 and 6, lecturing and directing the students, by the popular and unpopular teachers did not differ significantly. Both the groups were found to use these categories equally well. Lecturing is the form of verbal interaction that is used to give information, facts, opinions, ideas and explanation about content or procedure to the students. Directing implies giving directions, commands, or orders with which a pupil is expected to comply.

It is evident from Table 2 that unpopular teachers show significantly more use of category 7, criticizing and justifying authority, than the popular teachers. This shows that the popular teachers tend to criticize the students a little less than the unpopular ones.

The mean percentage occurrence of Categories 8 and 9, pupil-talk responses and pupil-talk initiations, for the popular and unpopular teachers did not differ significantly. Thus, it may be said that there are no significant differences in student-talk, (self-initiated as well as teacher-initiated) in the classes taught by popular and unpopular teachers.

Table 3 reveals that the Teacher Ques-

tion ratio (TQR) of popular teachers (24.7%) was higher than that of the unpopular teachers (18.7%). This ratio is a measure of the teacher's tendency to use questions when guiding the content-oriented part of the classroom discussion. It is also evident from the table that Teacher Response Ratio (TRR), which is a measure of the teachers' tendency to react to the ideas and feelings of the students, and Pupil Initiation Ratio (PIR), which indicates what proportion of pupil talk constitutes acts of their initiation, are almost the same for the two groups of teachers.

The students in a class invariably pay more attention to the teacher when he begins to express his feelings about and reactions to something a pupil has said. Such an immediate reaction of teacher-to-student talk is calculated with the help of the Instantaneous Teacher Response Ratio (TRR 8,9) and Instantaneous Teacher Question Ratio (TQR 8,9). The former is a measure of the teacher-tendency to praise or integrate pupil ideas and feelings into the fabric of class discussion, at the time the pupil stops talking. In the present study (TRR 8,9) ratios for the popular and unpopular teachers came out to be 78.9% and 67.3% respectively. This indicates that the former were much more likely to react to pupils' ideas and feelings with praise or encouragement than the latter. The (TQR 8,9) ratios in Table 3 also indicate that popular teachers (44.7%) were much more likely to put a question, compared to lecturing, than were the unpopular teachers (37.4%), at the termination of student talk.

Emphasis on content is calculated with the help of Content Cross Ratio (CCR). An exceptionally high CCR

would indicate an unusually high importance shown to subject matter. It would show that the teacher took a very active role in the discussion, and also that the motivation and discipline problems were at a minimum. These ratios for the two groups under study worked out at 41% for the popular and 29% for the unpopular teachers, indicating a lower emphasis on content by the unpopular teachers.

Steady State Ratio (SSR) indicates the extent to which teachers and pupils shift from one category to another. The higher the ratio, the less rapid the interchange between the teacher and the pupils. In the present study this ratio worked out at 39% for the popular and 47% for the unpopular teachers, indicating more flexibility in communication in classes handled by popular teachers.

Thus, the results presented so far reveal that the popular teachers differ significantly from the unpopular ones in the direction of using more and more acts of praising and encouraging the students, accepting and clarifying their ideas, and putting more and more questions to them. The popular teachers also showed more flexibility in communication while handling classes and put more emphasis on the subject-matter. There was also a tendency in these teachers to be less critical and less authoritative. It is noteworthy that in the studies by Jersild (1940), Hart (1934), Hopkins (1940), Crow and Crow (1948), and Koul (1972), it was found that students admired and related well to teachers who were less critical, less sarcastic and less nagging, who reacted to pupils' ideas with praise and encouragement, and who had a sense of humour and made use of non-threatening jokes in the class.

## REFERENCES

- ALEXANDER, W M. and HALVERSON, P M. *Effective Teaching in Secondary Schools*, New York. Rinehart and Co., 1957, 30
- AMIDON, E. and POWELL, E. *Interaction Analysis as a Feedback System in Teacher Preparation*, Philadelphia, Pa, Temple University, 1967
- BARR, A.S. "Wisconsin Studies of Measurement and Prediction of Teacher Effectiveness: A Summary of Investigation", *J Expt. Educ.*, 1961, 30 (1), 1-156
- *et al* "Second Report of the committee on criteria of Teacher Effectiveness," *J. Ed Res* 1953, 46(9), 641-645
- BONDI, J C. "Feedback from Interaction Analysis Some Implications for the Improvement of Teaching," *Teacher Educ*, 1970, 21(2), 189-196
- BROOKOVER, W.B. "Person-Person Interaction between Teachers and Pupils and Teaching Effectiveness," *J Ed Res.*, 1940, 34, 272-287
- BUCH, M B and ANTHANAM, M R. "The Classroom Verbal behaviour of selected teachers in Baroda Secondary Schools," *Communication in Classroom*, Baroda Centre of Advanced Study in Education, 1970, 21-50
- and — "Sex of the Teacher as a Factor of Teacher Classroom Behaviour", *Indian Educational Review*, 1971, 6(2), 47-66
- and QURAISHI, Z M "The Influence Patterns of Male Social Studies Teachers as Determined by Flanders' Interaction Analysis System", *Communication in Classroom*, Baroda : Centre of Advanced Study in Education, 1970, 51-68
- BUSH, R.N. "A study of Student-Teacher Relationships" *J. Ed. Res*, 1942, 35, 645-656
- CANE, B.S. Research on Teaching and Teacher Education: in *Educational Research in Colleges of Education*; paper presented at a Conference of Society for Research into Higher Education, 1967
- COATS, WILLIAM D. LLOYD, S. and WICKERT, J. "Student Perceptions of Teachers—A Factor Analytic Study" *J Educ Res.*, 1972, 65(2)
- CROW, L.D. and CROW, A. *Educational Psychology* New York. American Book Co, 1948, 27-28
- DAVIS, T N and SATTERLY, D J. "Personality Profiles of Student Teachers", *Brit. J Educ Psychol* 1969, 39, 183-187
- DOMAS, S J and TIEDEMAN, D.V. "Teacher Competence: An Annotated Bibliography", *J Exp. Educ.*, 1950, 19, 101-218
- EVANS, K M. "A Annotated Bibliography of British Research on Teaching and Teaching Ability" *Educ Res*, 1961, 4, 67-80
- EBEL, R L (Ed) *Encyclopedia of Educational Research*, London The Macmillan Co., 1969
- FLANDERS, NED A "Interaction Analysis in the classroom—Manual for observers" Minneapolis, University of Minnesota, 1960
- "Intent, Action and Feedback: A Preparation for Teaching" *J. Teacher Educ.*, 1963, 14, 251-260
- "Teacher Influence, Pupil Attitudes and Achievement" LE 32040, *Comparative Research Monograph No 12* U S. Department of Health, Education and Welfare, Office of Education, 1965, 19-21
- *Analyzing Teaching Behaviour*, Reading, Mass: Addison-Wesley Publishing Co., 1970
- GAGE, N L "Paradigms for Research on Teaching" *Handbook of Research on Teaching*, Chicago Rand Mc Nally and Co, 1963, 115
- GETZELS J.W. and JACKSON, P.W. *Handbook of Research on Education*, American Educational Research Association, Chicago. Rand McNally and Co., 1963
- HARRIS, C.W. *Encyclopedia of Educational Research*, New York: The Macmillan Co, 1960.

- HART, F.W. *Teachers and Teaching*, New York: The Macmillan Co., 1934, 6-7
- HAGGERTY, M.E. "The Crux of the teaching—Prognosis Problem" *Sch. Spe.*, 1932, 545-549
- HOUGH, J.B. and OBER, R. "The effect of Training in Interaction Analysis on the Verbal Teaching Behaviour of Pre-Service Teachers" In E.J. Amidon and J.B. Hough (Eds.), *Interaction Analysis: Theory, Research and Application*, Reading Mass: Addison-Wesley, 1967, 329-345
- HOPKINS, L.T. "Seniors Survey the High School", *Teach. Col. Rec.*, 1940, 42, 116-122
- JERFS, G.A., et al. "The Effects of Training in Interaction Analysis on the Verbal Behaviour of Teachers" *Mimeographed Research Report*, (Ed.) W. Clark High School, Las Vegas, Nevada, 1968
- JERSHID, A.T. "Characteristics of Teachers who are 'Liked Best' and 'Disliked Most'" *J. Expt. Educ.*, 1940, 9, 136-151
- KIRK, J. "Effects of Teaching the Minnesota System of Interaction Analysis to Intermediate Grade Student Teachers" *Unpublished Doctoral Dissertation*, Temporal University, 1963
- KOUL, L. "Factorial Study of certain Personality Variables of Popular Teachers in Secondary Schools" *Unpublished Ph.D. Thesis*, Kurukshetra University, 1972
- "Personality Differentia of Popular Teachers", *J. Educ. Psychol.* 1973, 31 (2), 68-73
- "A study of Sprangerian Values of Popular Teachers" *J. Educ. Res. and Exten.* 1973 a, 9(3), 178—184
- "Personality Needs of Popular Teachers" *Kurukshetra University Research Journal (Art. and Humanities)* 1974, 7(1,2), 22-26
- MARTIN, W.E. and STENDLER, C.B. *Child Development: The Process of Growing up in Society*, New York: Harcourt, Brace, 1953, 501-539
- MEDLEY, D.M. and MITZEL, H.E. "A Technique for Measuring classroom Behaviour" *J. Educ. Psychol.* 1958, 48, 86-92
- MONROE, W.S. *The Teaching-Learning Theory and Teacher Education*, 1890-1950 Urbana: University of Illinois Press, 1952
- MORSE, C.W. and WINGO, G.W. *Psychology and Teaching*, Bombay: D.B. Taraporevala Sons and Co., 1968, 234
- PAREEK, U. and RAO, T.V. "The Patterns of classroom Influence Behaviour of Fifth Grade Teachers of Delhi" *Communication in classroom*, Baroda: Centre of Advanced Study in Education, 1970, 119-147
- RICHEY, R.W. and W.H. FOX, "How do Teachers Compare with other community Members?" *Education Research Bulletin*, 1948, 27, 239
- SANTHANAM, M.R., QURAISHI, Z.M. and LULLA, T.P. "Patterns of Influence in Social Studies Teachers" *Communication in Classroom*, Baroda: Centre of Advanced Study in Education, 1970, 69-118
- WEBB, D. "Teacher Sensitivity: Affective Impact on students" *J. Teacher. Educ.* 1971, 22, 455-459



# What do you Teach, Sir ?

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You are lucky if you have not been asked this question. Such questions always simmer within the student's mind: "How is Hamlet's madness going to help me get a job in a bank?" The teacher, totally cut off from the milieu of his pupils, goes on bombarding them with quotations

"There is a significant practical/vocational requirement to be catered for by the school. The child must gain the skills and knowledge he requires to handle the writing tasks he will face both in and out of school. How justified in the assumption that such skills and knowledge will follow if imaginative writing is practised? A wide range of conventions appropriate to different situations would need to be covered, including those used in invitations, letters of

all kinds, telegrams, notes, summaries, diaries, rules, instructions, directions, reports, speeches, advertisements, newspaper articles, stories, appeals, minutes and so on...and all for diverse audiences and purposes".<sup>1</sup>

This clearly enumerates the various uses language is put to, and points out that the pursuit of literature continues at the cost of these practical skills. We never bother about the usefulness of literature-based courses. Let us look at it from the viewpoint of a learner. Why does a learner want to learn English? Does he want to appreciate the works of the great men of letters? Does he want to

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<sup>1</sup>Brumfit, C. J. & Burke S J ; *English in Education*, "Is Literature language or Is language literature?" Vol. VIII, No. 2, Oxford University Press, 1974 Summer

improve his employment prospects? Does a learner really care to know about iambic pentameter or the ballad measure? Can a person who writes an essay on Hamlet's madness describe his stomach trouble easily? Can a girl who writes about Lady Macbeth's insomnia explain her 'worries' to her family doctor in English? Can a M. A. in English draft an application to the Collector for a job or a complaint to the Post Master? Our students come to us hoping that their association with English teachers will enable them to write and speak good English. We are guilty of breach of trust. We belie their expectations. The young man wants to learn English to get a bank job, and we frighten him with iambic and dactylic; we shower upon him the choicest daffodils and fill his ears with the nightingale's song. Milton's grand style, Pope's use of the heroic couplet and Shakespeare's dark lady are poor aids in drafting an application. Are we teaching our students or just cheating them?

Our wise professors are reluctant to 'stoop low'. How can you expect them to do a schoolmaster's job? Between the schoolmaster and the professor, the learner is a victim of neglect. Our professors are unwilling to take leave of Rosalind and Portia and advise on paragraph writing, punctuation, and agreement between tense and verb. If they speak English intelligible to their students, they do not feel secure in their greatness. Their wisdom is in terms of their unintelligibility. The more unintelligible, the more learned.

Should we allow such a situation to continue? How can we convince the idolaters of literature that the teaching of language is in their own interest? It will reduce their pains. If the learner

has a good understanding of the language he will assimilate easily and quickly and the teacher will be spared his lengthy discourses. It needs a sound language base to understand a Shakespearian fool. The puns they use are exercises in the use of language. Without an understanding of language, literature can neither be understood nor appreciated. Teaching of language items is an asset.<sup>2</sup>

Several stock objections will be heaped at us for pleading a case for language.

- i. Why this problem at all? Language was never a problem with our students. Why is this new generation so 'poor' in English?
- ii. Our aim is to help learners appreciate literature. We want to teach morals through literature.
- iii. How can we correct them? We cannot give them weekly assignments and check their homework!

These objections are not valid. Education is no longer a class privilege. People from all walks of life flood the university campus. Students from the low-income group are bound to lack fluency in speech. They suffer from complexes which thwart their expression—both in writing and in speech. 'Angtezi Hatao' and the subsequent neglect of the language have started telling upon students today.

The various objections that the pundits have against teaching language are refuted by Pries who asserts that the classroom is no place for teaching morals

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<sup>2</sup>Dr Ramesh Mohan, Presidential address at the annual meeting of English Teachers' Association, Patiala (29-31 Dec. 1974)

and that it cannot be a psychiatrist's chamber.<sup>3</sup>

The claim that literature courses have made learners more sensitive to literature and that they find solace in it does not hold true. The younger generation hardly finds the Shakespearean heroes convincing. The pleasure derived from Tennyson and Coleridge are over-emphasized. We are not familiar with the rhythm of English speech. We can hardly distinguish between a stressed and an unstressed syllable. We are never sure of accent. How then can we enjoy English poetry ?

Literature is no longer the saviour and cannot sustain us, as was predicted by Arnold and Richards. A survey of school-teachers in England has revealed that 70 per cent of them do not turn to literature for recreation or appreciation. They rate this point very low on a 15-point scale.<sup>4</sup>

Undue emphasis on literature exposes

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<sup>3</sup>Fries C C, *The Teaching of English* (3 chapters).

1. Objectives of teaching literature
2. Principles underlying the teaching of literature
3. Organizing a course in literature
4. Yorke Malcom, *English in Education: Why study Literature?* (A Survey Report) Vol. 8 No. 2 Oxford University Press, (1974) Summer

the learner to English which is no longer in use. We continue to use Victorian English. We are suspicious of new words and quick to condemn them as slang. We become ludicrous when we address an "august body" on an "auspicious occasion". To an Englishman our speech and writing are loaded with archaic expressions. *Punch* caricatured an Indian doctor in England who fails to understand an Englishman's slang. He believes these people cannot speak good English. His patients, on the other hand, believe the doctor to be a Victorian ghost who speaks obsolete English. The first prescription that follows is : "Learn some good standard English."

Study Group Report (1971) decisions and resolutions at the annual meetings have asserted the claims of language teaching. These resolutions are yet to be implemented. To borrow an archaic expression—language teaching is conspicuous by its absence. We have yet to find out the cause of our irresolution and inaction. Are we waiting for some ghost to come and command us

*List, list O, List*

*If ever you love your subject*

*Revenge its foul, most unnatural murder.*



# Literature : How to Read and How to Teach

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## EZRA POUND

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*The following excerpts present the views of Ezra Pound (1885-1972), the poet and literary critic who deeply influenced the form and imagery of modern poetry. To the readers who may question our choice in presenting the views of a particular poet we humbly offer this argument: the experience of literature is something very different from that of any particular language. But then, this is not to say that there is a clear dichotomy between the two, nor to suggest that one of them can do without the other. Since the stuff of literature is exploration of man's consciousness of himself and the world around him, and since language records and conveys this consciousness, the former cuts across linguistic and ethnic distinctions, the latter does not. Here lies the difference or distinction between the two experiences.*

*And from this we can argue that this nature of the stuff of literature gives us the freedom to choose any writer or poet from any country and period. Ethnic or linguistic loyalty in this will only limit our literary experience. That will be inviting contradictions. Because literature frees a man, and too much loyalty to a language makes him sadly parochial. Our choice demonstrates our faith in this freedom.*

—EDITOR

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## HOW TO READ

LITERARY instruction in our 'institutions of learning' was, at the beginning of this century, cumbrous and inefficient. I dare say it still is. Certain more or less mildly exceptional professors were affected by the 'beauties' of various authors (usually deceased), but the system, as a whole, lacked sense and co-ordination.



I dare say it still does. When studying physics we are not asked to investigate the biographies of all the disciples of Newton who showed interest in science, but who failed to make any discovery. Neither are their unrewarded gropings, hopes, passions, laundry bills, or erotic experiences thrust on the hurried student or considered germane to the subject ....

In my university I found various men interested (or uninterested) in their subjects, but, I think, no man with a view of literature as a whole, or with any idea whatsoever of the relation of the part he himself taught to any other part... 'Comparative literature' sometimes figures in university curricula, but very few people know what they mean by the term, or approach it with a considered conscious method.

To tranquilize the low-brow reader, let me say at once that I do not wish to muddle him by making him read more books, but to allow him to read fewer with greater result. I have been accused of wanting to make people read all the classics; which is not so. I have been accused of wishing to provide a 'portable substitute for the British Museum', which I would do, like a shot, were it possible. It isn't...

### *For a Method*

Nevertheless, the method I had proposed was simple, it is perhaps the only one that can give a man an orderly arrangement of his perception in the matter of letters. In opposition to it, there are the forces of superstition, of hang-over. People regard literature as something vastly more flabby and floating and complicated and indefinite than, let us say, mathematics. Its subject-matter, the human consciousness, is more complicated than are number and space. It is not, however, more complicated than biology, and no one ever supposed that it was. We apply a loose-leaf system to book-keeping so as to have the live items separated from the dead ones. In the study of physics we begin with simple mechanisms, wedge, lever and fulcrum, pulley and inclined plane, all of them still as useful as when they were first invented. We proceed by a study of discoveries .....

And we could, presumably, apply to the study of literature a little of the common sense that we currently apply to physics or to biology. In poetry there are simple procedures, and there are known discoveries, clearly marked. ....In each age one or two men of genius find something, and express it. It may be in only a line or in two lines, or in some quality of a cadence; and thereafter two dozen, or two hundred, or two or more thousand followers repeat and dilute and modify.....

And if the instructor would select his specimens from works that contain these discoveries and solely on the basis of discovery—which may lie in the dimension of depth, not merely of some novelty on the surface—he would aid his student far more than by presenting his authors at random, and talking about them *in toto*.

Needless to say, this presentation would be entirely independent of consideration as to whether the given passages tended to make the student a better republican, monarchist, monist, dualist, rotarian, or other sectarian... You do not divide physics or chemistry according to racial or religious categories. You do not put discoveries by Methodists and Germans into one category, and discoveries by Episcopalians or Americans or Italians into another...

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...It appears to me quite tenable that the function of literature as a generated prize-worthy force is precisely that it does incite humanity to continue living; that it eases the mind of strain, and feeds it, I mean definitely as *nutrition of impulse*.

This idea may worry lovers of order. Just as good literature does often worry them. They regard it as dangerous, chaotic, subversive. They try every idiotic and degrading wheeze to tame it down. And they do this from sheer simian and pig-like stupidity, and from their failure to understand the function of letters...

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In introducing a person to literature one would do well to have him examine works where language is efficiently used; to devise a system for getting directly and expeditiously at such works, despite the smokescreens erected by half-knowing and half-thinking critics. To get at them, despite the mass of dead matter that these people have heaped up and conserved round about them in the proportion : one barrel of sawdust to each half-bunch of grapes. Great literature is simply language charged with meaning to the utmost possible degree...

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### THE TEACHER'S MISSION

'Artists are the antennae of the race.' If this statement is incomprehensible and if its corollaries need any explanation, let me put it that a nation's writers are the voltmeters and steam-gauges of that nation's intellectual life. They are the registering instruments, and if they falsify their reports there is no measure to the harm that they do. If you saw a man selling defective thermometers to a hospital, you would consider him a particularly vile kind of cheat. But for 50 years an analogous treatment of thought has gone on in America without throwing any discredit whatever on its practitioners.... The first step of educational reform is to proclaim the necessity of HONEST REGISTRATION, and to exercise an antiseptic intolerance of all inaccurate reports about letters—intolerance of the same sort that one would exercise about a false hospital chart or a false analysis in a hospital laboratory...

As the press, daily, weekly, and monthly, is utterly corrupted, either from

economic or personal causes, it is manifestly UP TO the teaching profession to act for themselves without waiting for the journalists and magazine blokes to assist them.

The mental life of a nation is no man's private property. The function of the teaching profession is to maintain the HEALTH OF THE NATIONAL MIND. As there are great specialists and medical discoverers, so there are 'leading writers'; but once a discovery is made, the local practitioner is just as inexcusable as the discoverer himself if he fails to make use of known remedies and known prophylactics.

A vicious economic system has corrupted every ramification of thought. There is no possibility of ultimately avoiding the perception of this. The first act is to recognize the disease, the second to cure it....

All teaching of literature should be performed by the presentation and juxtaposition of specimens of writing and NOT by discussion of some other discussor's opinion *about* the general standing of a poet or author. Any teacher of biology would tell you that knowledge can NOT be transmitted by general statement without knowledge of particulars. By this method of presentation and juxtaposition even a moderately ignorant teacher can transmit most of what he knows WITHOUT filling the student's mind with a great mass of prejudice and error. The teaching may be incomplete but it will not be idiotic or vicious. Ridiculous prejudice in favour of known authors, or in favour of modern as against ancient, or ancient against modern work, would of necessity disappear.... The humblest teacher in grammar school CAN CONTRIBUTE to the national education if he or she refuse to let printed inaccuracy pass unproved :

(A) By acquiring even a little accurate knowledge based on examination and comparison of PARTICULAR books.

(B) By correcting his or her own errors gladly and as a matter of course, at the earliest possible moment.

For example, a well-known anthology by a widely accepted anthologist contains a mass of simple inaccuracies, statements contrary to simple, ascertainable chronology. I have not seen any complaints In the *English Journal* inaccuracies of fact occur that ought to be corrected NOT by established authors, but by junior members of the teaching profession. This would lead inevitably to a higher intellectual morale Some teachers would LIKE it, others would have to accept it because they would not be able to continue without it. False witness in the teaching of letters OUGHT to be just as dishonourable as falsification in medicine. □

# Poetry in Indian Schools

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IN one of Satyajit Ray's early films which brought him international recognition, there is striking but not harsh criticism of the way English poetry is taught in Indian secondary schools, or for that matter to undergraduates. A typical Indian schoolmaster, benign-looking but taciturn, enters a classroom, and without speaking a word to break the oppressive silence, writes on the blackboard :

SYNOPSIS

Through the labyrinth of half-understood verses Indians students of English poetry go about looking for figures of speech like a pack of hounds after farm rabbits. In the teaching of literature in the regional languages too, the situation is not very different. The preponderant emphasis is still on meanings of 'difficult words', usage, *alankar*, questions and answers etc.

Some teachers of English do give 'appreciation' lessons. Few succeed, and

for reasons not far to seek\*. In view of the linguistic competence of the teachers as well as the taught, English poetry should not be included in the school curriculum. If the teacher has not understood well, much less enjoyed a poem, what will he lead his students to appreciate ?

T S Eliot held that "a poem could be enjoyed *before* it is fully understood." But surely, some understanding is necessary. Visiting teachers and scholars from Britain give grim pictures of what they have seen and experienced here. One visiting professor, after some experience of teaching poetry in Indian colleges, wrote :

"If then, this is the state of poetry study among our young men in India, why include English poetry at all in their college curricula ?" The late J.G. Burton, who had travelled extensively in India and had contacts with teachers and students of English, did not favour inclusion of English poetry in the school textbooks.

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\* Most of them have been under the spell of Hadow who wrote for English teachers teaching English poetry to English children in England, or have been influenced by someone like Champion who wrote when English was given more time in Indian schools than any foreign language in any school system in the world, or like R L Mehta who had been teaching Indian children from homes where the *matrises* had been upgraded as 'mummies'.

There is a growing realization that students must know a language well before they can appreciate its literature. Not only in schools but also in colleges, students do not acquire the feel of the English language, and their literary instruction is therefore premature.

Literature should indeed have pride of place in the language curriculum. Study of literature is excellent training in forms of language. Literary masterpieces are, as Ezra Pound said, "language charged with meaning to the utmost possible degree". All prose and no poetry will dull the sensibility and imagination. The language of communication and utility for practical affairs of everyday life will not satisfy "the instinct for conduct" or "the instinct for beauty". Nor can the claims of modern scientific culture and vocationalism displace literature from its pre-eminent place in education. The heart has its claims too :

*God guard me from those thoughts men think*

*In the mind above :*

*He that sings a lasting song*

*Thinks in a narrow bone*

C P Snow stresses that scientists should be trained not just in "scientific" but also in "human" terms. Lenin said, "Socialism will bring you to Heaven. But you will not be able to enter it without culture". Here is the role for literature in the mother tongue. Besides, it will pave the way for genuine appreciation of foreign literature at the appropriate stage. Prof. E.W. Hawkins has observed : "Student are unlikely to be able to assess in a foreign language the literary qualities of works whose equivalents in their own language they have never read."

In misguided zeal to 'raise the standards of English', Shakespeare 'in the original' has been included even in pre-university courses. Students who have enjoyed reading Indian poetry may have

better understanding and appreciation of Shakespeare's lines. For example, "Light thickens, the crow makes wing to the rooky wood" may bring back to their mind Iqbal's line : "*Sooraj ne jaate jaate shaame siyah qaba ko; Tashte ufaq se laakar laale ke phool maare.*"

A literary base in the mother tongue will illuminate readings in foreign literature.

What poetry in Hindi is prescribed and how is it taught in the secondary schools ? Much of it is meretricious, mawkish, too hortative and in archaic language or dialect. The verses are dissected and explained. The fact that young people retain an interest in poetry in spite of all this is a tribute to their natural sensibility.

Good anthologies for Indian languages should be prepared by scholars and educationists, and suitable poems from these may then be selected for students at various stages. Scholars of eminence should be commissioned to do for Indian languages what I A Richards did in *The Method of Practical Criticism*.

Lastly, the teacher of an Indian language needs instructional material. For some English texts good work has been done in the Central Institute of English, Hyderabad. The schoolteacher carries a heavy load and works under stultifying conditions in a demoralizing atmosphere. He has neither the time, nor the energy, nor the will to consult books in the library even if he has easy access to one. Yet teacher—educators and departmental officers go on exhorting and prodding him to come well-prepared and equipped with notes and aids. In England students can enjoy on records John Gielgud's edifying recitations of English poetry. In India our students have to make do with paraphrase and meanings of Sanskritized ex-

pressions. To make matters worse, the poems prescribed are usually loaded with classical allusions). These have been selected 'to teach', not 'to give delight'.

It should not be difficult for some central agency to make available to schools recorded recitations of selected Indian poetry. Teaching aids for poetry lessons are no less important than apparatuses and maps for science instruction. Attractive charts for botany lessons, for example, are found in all schools. Why

cannot large coloured pictures be made available to illustrate poetry lessons? If the teacher is taking a poem of Iqbal (*Himalayas*) and comes to the line, "*Barf ne baandhi hai dastaare fazeelat tere sar*", he should be able to find in the set of pictures provided for this particular anthology, say a scene showing a king tying a turban round the head of a celebrated scholar or poet.

Teachers' kits for science teaching are a necessity. Kits for literature lessons are needed too. □

# The Teaching of Classical Languages

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IN discussions of education and educational patterns, it is the languages that are, like poor relations, left to hang on to the margins. At each subsequent discussion, their position recedes further. In the interests of the sciences, it has recently been advocated, and in some quarters accepted, that the languages should not be a burden to the students to the end and must be got over with before the graduate stage. Before this, the prevailing view was that as the sciences had to be put across to the students in their own languages, language study should continue in the graduate classes. The pendulum has always been swinging.

On the other hand, with the attainment of freedom, the regional languages had been gaining prominence. Although English had suffered a setback during this epoch, the falling academic standards had warned educationists and advocates of science and technology, that the neglect of English, the window to modern

knowledge, would be suicidal for a developing country. The whole question of language study assumed a sudden gravity because of the Constitutional provision for Hindi as the national language and the need to develop it for this role. In the face of opposition from many quarters to its compulsory study, leaders have given assurances from time to time that there would be no compulsion and that the role of Hindi would be that of a link language. Steps for more widespread use of Hindi have, however, been taken. Against the backdrop of this tussle between Hindi, English and the regional languages, what chances do the classical languages have of claiming a place in the curriculum? There is a Tamil proverb which says: 'In the high winds of *Ashadha*, when stone-mortars are flying, what can silk cotton do?'

The classical languages are our national heritage. While their study is not informative in nature, it is formative of character, ideals and attitudes. They

cannot be ignored in education, which is said to draw out the best in one's personality. They provide the moorings and the base, and the way in which an individual reacts to situations or views the major issues of life is determined by them.

These qualities cannot be left over to be imbibed in later life, nor in a casual manner. They are best inculcated in the young years. We may consider the question by taking Sanskrit among the classical languages. The classification of Sanskrit as a classical language of India is itself not correct. For Sanskrit cannot be regarded as Greek and Latin in Europe. Sanskrit continues to live, and not only as the repository of literature, religion, philosophy and the arts. It is inseparably fused with the modern Indian languages—the North Indian ones which are its daughters, and the South Indian ones with which it has co-existed for two thousand years. In fact, according to the Constitution, Hindi, which is to develop as the national language, is to draw on Sanskrit for its growth. Much of the literature in one's own mother tongue would become unintelligible but for knowledge of Sanskrit. This is true even of the literatures of the South. Jawaharlal Nehru in laying down guidelines for independent India, said: "I would personally like as many Indians as possible to know Sanskrit, which is the very basis of our culture. I see no difficulty about all this. The more languages one knows, the more one knows one's own language. Where is the element of force about this? If we ask a child to learn arithmetic or geometry, is it force?" He also observed: "If I was asked what is the greatest treasure which India possesses and what is her finest heritage, I would

answer unhesitatingly—it is the Sanskrit language and literature and all that it contains. This is a magnificent inheritance, and so long as this endures and influences the life of the people, so long the basic genius of India will continue."

It is the view of psychologists that children have a special gift for learning languages. During my visits to foreign countries, I found, among the Indian families living there, that the children, through play with local children, picked up French or German much faster than their parents. To learn Sanskrit along with the mother tongue and English should be no burden to them. In the Hindi-speaking areas, it is only a three-language pattern. The problem is only in the non-Hindi-speaking States, in which, along with Hindi, it becomes a four-language pattern. Even here, Sanskrit should not be a burden, for Hindi and Sanskrit are related by script and vocabulary. A composite course in Sanskrit and Hindi may also be designed. This is one of the patterns recommended in the Report of the Sanskrit Commission of the Government of India.

Since we are constantly in touch with the mother tongue—at home and via the printed page, one may ask whether so much time should be spent on it in school and whether it should be studied to the end of the degree course. It may be said that the classical languages are not spoken languages. This is not true of Sanskrit, most of the vocabulary of the modern Indian languages being derived from it. The sense of familiarity is certainly there, English is not the language of this country but its words are familiar to us. The Sanskrit-permeation of the mother tongue gives, even in Tamil, a further method



of easy induction into Sanskrit. Words of Sanskrit derivation could be picked out from Tamil, for example, and their correct Sanskrit forms, with aspirate or soft sounds or other required phonetic adjustments given to the students, with explanations of the meanings, including such semantic shifts as may be necessary.

Sanskrit is considered to be a difficult language, as its grammar is difficult to master. No language is easy to learn. English, particularly with the vagaries of its pronunciation, is a difficult language and yet Indians do not shy away from it. Sanskrit grammar may be tackled from different angles. The study of grammar, especially that of a classical language, is by itself a good discipline for the mind in its formative stages. The very word *sanskrit* means its beautiful grammatical structure. An European Sanskritist exclaimed, "I love Panini, because he reveals the spirit of the language (Sanskrit); I love the language (Sanskrit) because it reveals the spirit of the country." The rigours of a grammatical study of Sanskrit could be mitigated or eliminated by evolving a direct method of teaching.

Simple grammatical analyses and identifications could go hand in hand with the imbibing of the language through speaking and writing; or grammar could come at a later stage. Not everybody who writes or speaks in his mother tongue or a foreign tongue like English has a good grasp of its grammar. Expressive forms of speech should be taught through conversation lessons. There are some medieval Sanskrit pedagogic works written in a conversational style for the purpose of teaching the language in a popular way. *Girvanapadamanjari* of Varadaraja and *Girvanavanmanjari* of Dundhiraja are examples. Apart from

this, when teaching Sanskrit verse or prose, the traditional *akanksha* method should be followed. It is an effective method of combining the teaching of grammar with the teaching of language and literature.

A feeling for the classical language and a familiarity with it must first be developed. For example, in the case of Sanskrit, there are prayers and wise sayings (*subhashitas*) which should be taught orally in the beginning. The simple lessons that come at the next stage should have an attractive, pictorial presentation. Fortunately for Sanskrit, there are the animal fables of *Panchatantra*, which could be used for illustrated textbooks. The stories and pictures of birds and animals would kindle curiosity, promote enthusiasm and sustain eagerness among the young.

Ponderousness and pedantry have unfortunately beset the study of classical languages. Simple language is always the best. The Sanskrit of the fables, of the *Ramayana*, the *Bhagavadgita*, and even of Kalidasa, is simple and effective. In the Sanskrit plays, especially the early plays like those of Bhasa and Kalidasa, we have access to the spoken language. Students reading them pick up easily the ability to express themselves.

There is music in Sanskrit, and reading it aloud has a sonorous effect. All such auditory effects should be used in teaching the language. 'Sanskrit without tears' is not an impossible proposition. Sanskrit education is being promoted by the Rashtriya Sanskrit Sansthan, but no enterprising or bold experiments have yet been undertaken. A series of model lessons on disc or tape would help private learners—those who have spare time only after the school hours, and those in far-off places where no

Sanskrit teacher is available. Research in the teaching of Sanskrit is being conducted at the Institute of Languages in Mysore and this has to be put to use and test.

All over the country, there are numerous volunteer organizations for teaching Sanskrit in the evenings. All such efforts should be encouraged. The

examinations conducted by these voluntary bodies should be screened and recognized as qualification for entrance into recognized colleges and traditional pathashalas. The daily Sanskrit news bulletin on the AIR is of course a token of official recognition, but what is really needed is a regular schedule of lessons in the classical language. □

# A Diagnostic Study of the Problems of Teaching English in Technical Institutions

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V. S. SIVAMOHAN  
ISRABL MANSINGH

STUDENTS of science must encounter books written in English. Most students have difficulty with textbooks in English because there are many new words in these books and the new words are often big and strange. This is true because now regional medium is practised in schools and colleges. Upto the pre-university level the students must have come across 3500 words and investigations reveal that the average student can recognize and understand only 1500 words. So the main stress of teaching English in science institutions should be on vocabulary expansion. This is the most important need, according to our survey. Until he has the required vocabulary it is not at all possible for him either to follow lecture classes or read his own books in the subjects he is studying. For the expansion of vocabulary new words are

not to be chosen at random and investigations suggest that texts with the most common words in use must be prescribed.

Advanced and applied technical words which are so much the part of the subject matter should be avoided by the language teacher. Such words should be dealt with by the subject matter specialists.

These students have another difficulty. When they enter the colleges they have a limited knowledge of the structure of English sentences. They may have to use frequently these structures later on in life in writing and speech. To make them familiar with these structural items, the language teacher must design and choose proper exercises. In science books we find many words conveying special meanings instead of the

meanings the students know already. This leads to ambiguity, e.g. unit and unity, moment and momentum.

Scientists do not like to use ordinary words which may have more than one meaning, but they choose words which have universal meaning. That is, words which are accepted by scientists all over the world. Thus, even though the common words are equally good, the scientists prefer special words. In other words scientists use scientific English. Some of them have their origin in Latin and Greek, e.g. agronomy, micro-biology, etc. This problem not only exists for Indian students but also all for English speaking students including the British.

It is a vain hope to assume that something has been already done at the school level to lay a fairly sound foundation for the kind of English which is expected at the college level. With the introduction of a revised syllabus it will be possible to make the students acquire the necessary skills to pursue a higher course of study in English at the degree level.

One cannot expect the students to attain proficiency in the writing of critical or simple essays even on their textbooks within a brief period of nine or ten months.

Language is effectively learnt through literature. Ideal literary pieces must be presented before the students, particularly in degree classes, to develop an aesthetic sense in the formative period of their lives. Their individual talents and language skills are to be developed as an art. Grammar and usage can be taught incidentally in appropriate situations. Hence the syllabus may accommodate some modern essays, fiction, speeches, sports and adventure, biography and autobiography, science, historical events, geographical features and short stories, one-act plays, and minor poems to sublimate the individual aptitude and ability side by side while learning the English language.

Choice of textbooks may be the work of a group of experts and not a single person, to avoid personal limitations.

#### REFERENCES

- Allen, Harold, "Teaching English as a Second Language", Tata McGraw-Hill, Bombay.  
 Candlin, E. Frank, "An English Course for Professional Students", University of London Press Ltd.  
 Herbert, A. J., "The Structure of Technical English", English Language Book Society.  
 Mackey, William Francis, "Language Teaching Analysis", Longmans, 1965 Edition.  
 Mukhi, H. R., "Engineering English", Satya Prakashan, Delhi.



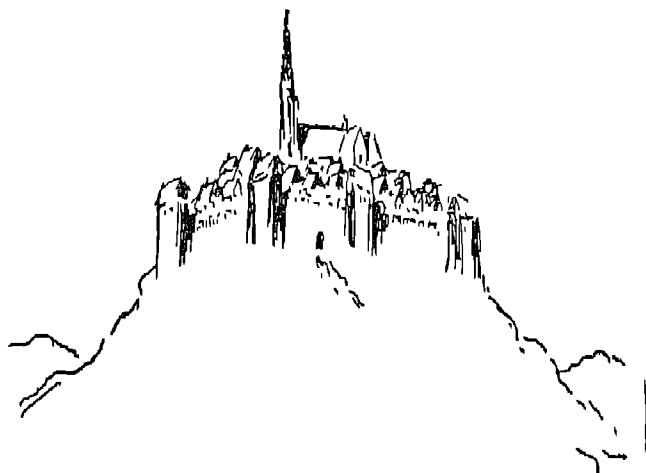
# Illustrations for Supplementary Readers in English

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SANTO DATTA  
Editor, Journal Cell, NCERT

THE AIM of supplementary readers in English, or for that matter in any language or discipline, is to broaden the curricular base of the syllabi. Some of them may be directly related to the approved textbooks, some may provide a more informed background, containing original literary pieces and presenting the increasing variety of the use of language.

The main point then is to broaden or to extend what has already been treated in the textbooks. Or, to put it in another way, the direction of the supplementary readers is from the familiar to the unfamiliar,

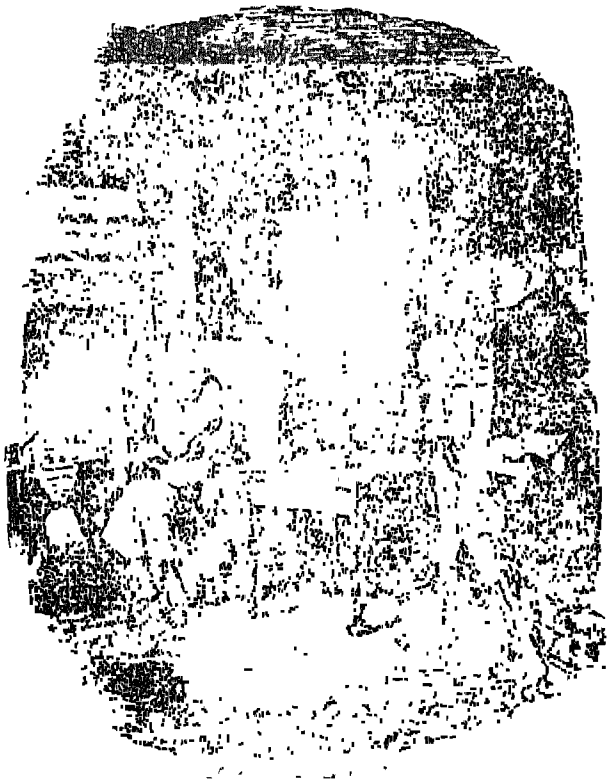


This is an example of the rare author-artist—Hendrik Willem van Loon. This illustration of a mediaeval castle is 'quoted' from his *STORY OF MANKIND*. Note the effect of the bare lines that unify the castle of a feudal prince with a hilltop, commanding the plains down below (not shown here, only suggested), which are tilled and taken care of by the serfs—the labour base of the feudal system.

This kind of illustration, with the participation of an informed and imaginative teacher, can visually present the stages of social development convincingly. Like the text, the illustrations should also be 'explained' by the teacher. Because in the classroom, he is the interpreter of the writer and the artist.

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\*The paper was presented at the Workshop on the Preparation and Evaluation of Supplementary Readers in English, held at the Regional Institute of English, Bangalore from 6.9.76 to 11.9.76. The workshop was sponsored by the Department of Textbooks, NCERT.



John Leech, one of the famous illustrators of Charles Dickens, does not frighten the readers (*MAREY'S GHOST IN A CHRISTMAS CAROL*), yet gives them a view of the unearthly and the eerie. The effect of this may be compared with that of the modern 'horror' comic illustrations that are sickening in their feverish attempts to frighten the readers.

Almost all the illustrators of Dickens, including Cruikshank and Leech, grasped the psychological effect of the poor and lower-middle class interiors—seamy, dank and dark—as described by Dickens. Note the darkening cross-hatches in most of the illustrations of his works. This can be compared with the light or light-usheering cross-hatches in the drawings of Tenniel when he illustrated Lewis Carroll's *ALICE BOOKS* (see next page). Our illustrators should take note of this psychological aspect of the themes.

widening the mental horizon of the curious student. And it so happens, the main point of any illustration is precisely the same: to extend or to broaden, in

visual terms, what has been discussed or described in the text. This similarity between the two media of communication I would like to emphasize.

Contrary to the popular notion, illustrations are *not* required to make the text 'attractive' to the readers. Making a book attractive with illustrations is to be concerned only with the surface of the problem. Because its attractiveness is a necessary by-product of the total effort made for efficient communication. Any illustrated reading material that fruitfully communicates is of necessity attractive. A well illustrated text is an organic whole from which the withdrawal of a single illustration or a single paragraph may mean mutilation of the organic unity. We will come back to this later.

Here, however, we should draw a line between the illustrations that are made to visually interpret or inform a text already written by an author, and those made for the supplementary readers we are going to prepare.

In the first case, the illustrator works on an accomplished fact—the manuscript, already written by the author who did not consult the artist when he wrote it. Charles

Dickens, for instance, did not consult Cruikshank, his celebrated illustrator, about the visual effects of the incidents and characters in his novels and stories.

Yet, Cruikshank's "were the perfect illustrations for Dickens and one feels that there was an accord more complete than usual between author and artist. Both were fascinated by London and in the work of each is a strong leaning towards the grotesque..." (David Bland, *The Illustration of Books*) John Tenniel illustrated Lewis Carroll's *Alice* books after they were written. It was a separate act of creation.

But the role of the illustrator for our supplementary readers is very different, because the failure and success of the material is shared by the author, the artist, the production expert and the printer. But then, that is an ideal state of things I'm talking about. The actual practice is regrettably different from what it should have been. But before that, I would like to explore the generic nature of illustration, no matter where and how it is used. For this, we may have to look back into the past.

To me, a picture or an effective illustration has always been something revelatory, occurring like a flash, revealing meaningful relationships between forms, characters and places, enlivening and stretching the viewer's imagination in space and time. Perhaps the awareness of this nature of illustration formed the intent of the mediaeval illuminated manuscripts, illustrated by hand. Because the word 'illumination,' now no longer inter-

changeable with 'illustration', is from the Latin word *illuminare*, meaning 'to light up'. According to some experts, the term was used because those who made illuminated manuscripts were trying to light up the word of God, in an age when literacy



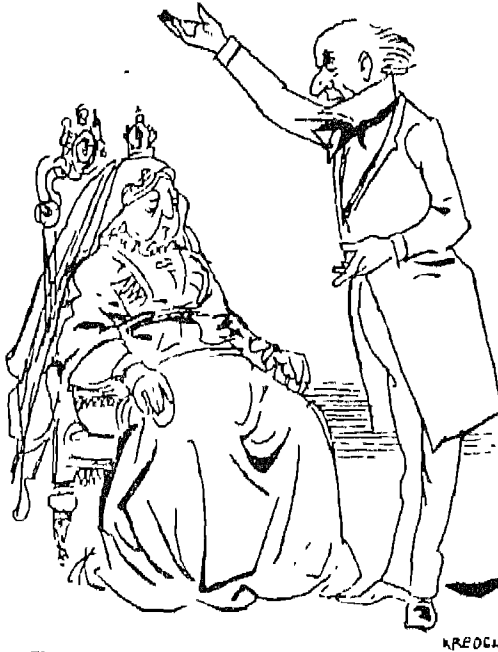
'The Mad Tea-Party' in Alice's wonderland, as interpreted by Tenniel. Note how convincingly he presents a world of fantasy, so much so that before you start doubting the relevance of a dormouse or a hare to a tea-party (with table-cloth, crockery and all), you feel like censoring the misbehaviour of the 'funny three'.

The 'stage-set' composition of the tea-party (all facing the readers) also reflects the stage-setting of a Victorian play. The unusual and interpretative 'cinema angle of vision'—so effectively used by our contemporary illustrators—was not there in the nineteenth century. Van Loon fetchingly used this modern angle of vision in some of his illustrations (see his 'Death of Hannibal' in *THE STORY OF MANKIND*).

was confined to the priests and a few of the feudal and, later, merchant elite.

With this specific intent in view, it may certainly be said that the frescoes for the church interiors, painted by Giotto, Raphael, Michaelangelo, and many others, were 'illuminations' that illustrated and visually interpreted the Gospel for the poor and the illiterate. Their 'attractiveness' or decorative potential was a by-product of the original intent. They

were revelatory in nature. This role of illustration or illumination was understood even by the ancient Egyptians, and the classical Greeks and Romans illustrated plays, poems and stories as well as scientific works.



Here Fritz Kredel is illustrating Queen Victoria's comment on William Gladstone's mode of ordinary conversation: 'He speaks to me as if I were a public meeting.' [*THE LITTLE BOOK OF FAMOUS INSULTS*, edited by Betty Jo Ramsey.]

Note how the bored look on the queen's face is contrasted with the dramatic gesture and grimace of Gladstone

So, illustration is another dimension of the word, a further leap that imagination takes after being informed by the word. It communicates directly.

In view of the nature of illustration, we can clearly see the importance of its role, particularly in the books written for the young. This revelatory nature should be kept in mind when we design a supplementary reading.

Illustrations in this context can be

broadly divided into two kinds. The first is plainly explanatory, such as geometric diagrams, drawings of machines etc. For conveying sheer information, they should be prepared by professional draughtsmen, drawn unvaryingly to a

particular scale and their reduction size should be kept uniform throughout the book. An uneven tenor in this will hamper or distort the reader's visual grasp of the information.

It is with the second kind that the illustrator-artist comes in. He is to visualize a concept, an idea, an incident happened long ago or far away. He is to transport the reader from the cold printed lines to a world of vision that is subtly informed by the words in the text. In short, he is there to communicate on a different plane and his language is suggestive imagery which, while being informed by the text, informs and enriches the text, also. The illustration leads from the familiar words to the unfamiliar vision; suggesting the possible, unforeseen extension of what has been said.

The effect of this relationship is bracing for the young minds in their formative period. It reveals the hidden or misunderstood relationships between ideas and events, cause and effect, clearly and arrestingly.

The difference between the two kinds, however, can be shown from the following example. The diagrammatic representation of the solar system, showing concentric and overlapping ellipses, informs the readers of the geometrical relationship between the planets. But only an imaginative illustration with delicate tonal variations can effectively suggest the immensity of the four-dimensional stretches where the solar system appears



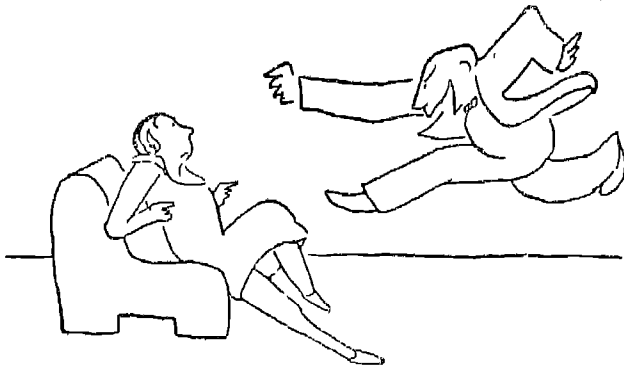
as a few scattered specks.

That the preparation of supplementary readers is a teamwork is often forgotten. After he has written the material, the author suggests some visuals to the artist. The artist, since he was not consulted before, may very well miss the intent of the author. And his illustrations may prove to be troublesome to the production expert who is painfully aware of the limitations in terms of the varying qualities of paper, of different printing processes, of the inconvenient format suggested by the author or the artist. The result is failure to communicate. This, of necessity, makes the end product unattractive despite the illustrations

But it should have been otherwise. After the preparation of the first draft, three sets of triangular discussions should be held. The first between the author, the artist and the production expert; the second between the artist, the editor and the production expert, and the third between the artist, the production expert and the printer.

In the first meeting, if it is about a supplementary reader in English for the middle school children, the author and the artist should agree to have simple line-drawings with flat bright colours, suiting the simple language and treatment the author has in mind. The author should also make it clear to the artist how or why he wants the intent of an adjective or the force or process of a

verb to be expressed in graphic images. The production expert may help them in deciding the format of the book and the typography needed for the subject. Here the role of a production expert is impor-



The Thurberian thrust in courtship, one of the moves illustrated and prescribed by James Thurber. It is a relatively rare example of an author illustrating his own writing.

The 'theme' of the illustration is hardly suitable for our supplementary readers, but we should note the linear treatment of the theme. Thurber summarizes the human form with economy of lines and makes them float on a different plane—the fables of our times. Yet, the forms are recognizable and their actions and intentions are obvious.

tant, because he knows the limitations of different inks on different qualities of paper. Besides, he will take care of the family and size of a particular type-face most suitable for the work. If the projected illustrations come in big areas of flat colours, the type-face should be big, otherwise the total print area will look anaemic in comparison with the illustrations. This triangular discussion will bring out the problem of communication in proper perspective, and help the author in visualizing the effect of the projected book on its readers.

In the second meeting, after the final draft is prepared, the editor, the artist and the production expert decide on the most effective arrangement and presentation of the material. In the third meeting, the artist, the production expert

## The Fables of Aesop John C. Ely



canno in to the forst / And Iohanne the Wyldz bestes salve  
 hym come / they were so ferdsfull that they alle beganne to flee /  
 For they wend / that it had be the Lyon / And the mayster of  
 the asse sechyd and soughte his asse in every place al aboute  
 And as he had soughte longe / he thought that he wolde go in  
 to the forst for to see pf his asse there / And as soone as

This is from one of the earliest English illustrated books CAXTON'S AESOP. It is as blunt and direct as the text was.

and the printer discuss the final shape of the material.

Whether the material is meant for the middle or higher secondary classes, photographs should be used sparingly or not at all. Children in general are more familiar with the linearity and local colour of an object than with its volume that is expressed in photographic chiaroscuro. Besides, a photograph, if it does not have genuine artistic merit, is often something of a documentary, and does not lead the students to think and ima-

gine further. Moreover, hand-drawn illustrations, if they follow the spirit of the text, which is sometimes jovial, sometimes telling stories with easy grace, will take away the usual dryness and compulsion involved in the teaching-learning process. The bright and colourful forms or landscapes will come as little pieces of holiday even when the students are attending classes.

For the higher secondary students, the illustrations can safely be sophisticated. They can even be in monochromes,

using dramatic angles of vision, subtle suggestions of deep space, twilight or morning mist, and complicated tonalities, of course, modified or changed by the production expert who knows the cost and the particular process of printing involved.

For a change, simple one or two-coloured woodcuts can be used for the middle school readers. For the higher classes, considering the cost, illustrations made in clear pen-and-ink or brush-and-ink, or a mixture of the two, can be used.

Now comes the question whether there is any basic difference between the illustrations made for the textbooks and those made for the supplementary readers. I am afraid, there is no basic difference between the two. Everywhere the illustrations have to be lively, meaningful and, therefore, communicative.

The other problems are what to illustrate and what should be the ideal style of illustration. All these depend on the first meeting between the author, the artist and the production expert. Yet, as a rule, all illustrations for the middle school readers should be simple in conception and colourful. But the artistic excellence is always a must.

As for those meant for the higher classes, the new idioms of modern art may be avoided with profit, because they not only need experienced eyes, but also a lot of reading to be properly appreciated. The naturalistic style is the most suitable for this stage.

What to illustrate is again a problem

for the author and the artist at the first meeting, depending on the nature and quality of the textual material. But some suggestions can be made for general guidance. If, for instance, the text is a collection of literary pieces meant for the secondary classes, and if those pieces are about foreign lands and people written by English authors, the illustrator should try to give the readers a feel of the exotic. In costumes, in architectural or furniture details, in period styles, in flora or fauna, in everything the illustrator should try to bring home the exotic and the unfamiliar. Otherwise the objective of the supplementary readers will be lost. In the same way, if some of the pieces are about, say, the ancient or protohistoric India, the artist should visit the archaeological museums for period styles in dresses, furniture and other things.

This is not to say that the illustrations should be heavy with details. What I intend to say is that subtle suggestions should be made regarding the unfamiliar and the unknown. At this point, an informed author and an equally informed and enthusiastic artist may help each other immensely. As regards the positioning of the illustrations, the artist must have a dialogue with the editor and the production expert.

After all this, I would like to repeat that the preparation of the supplementary material is essentially a teamwork, each participant enriching, informing and modifying the other. And the team should never forget the nature of illustration, which is primarily revelatory. □

# Educational Research Conference—ERIC

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*Theme* : *Psycho-Social Studies*

*Chairman* : DR. SHIB K. MITRA

Joint Director, NCERT

PROF. PRAYAG MITTA

Senior Fellow, National Labour Institute, New Delhi

The following three papers were presented

## I LOGICAL THOUGHT DEVELOPMENT IN CHILDREN (AGE-GROUP 4 TO 8 YEARS)

PROF. NARAYAN RAO

THE problem was transfer of conservation training to the concepts of mass, weight and length, using three types of materials—wire, cubes and plasticine. A factorial design of  $2 \times 2 \times 3 \times 3 \times 5$  with 432 subjects of both the sexes belonging to the age-group of 4 to 8 years was used. The subjects were given a training on conservation of mass, weight and length for a week in a laboratory. They were thereafter tested for conservation of area and volume.

The results indicated that there was no transfer-effect from the experimental

condition to the criterion condition as a result of the training. Secondly, in any single age-group, there were children who performed better than others. The implication of this finding was that the children who had a rich environment before training did better than those who had poorer environments. Thirdly, no sex differences in transfer of training were found.

The discussion of the investigation focussed on the following issues :

1. Should Piaget types of studies be conducted in our country ?
2. Should the groups be merely recognized by such terms as urban and rural, advantaged and disadvantaged, or should the variables of the groups

be analysed instead of being confounded into global terms ?

3. Could generalizations be made from Dr. Rao's study ?

It was observed that some global experiences were necessary to develop certain concepts and if some cultures did not provide these experiences, they would not develop the required concepts. Therefore, one would not know why certain concepts were not developing in disadvantaged children, if the effect of the intervention/enrichment programme was not experimented upon.

The study of Dr. Rao being of a very limited nature, generalizations for changing the curriculum on its findings could not be made.

In India there are various ways of defining the rural population—as defined in the census by geographical location, the population in a habitat etc, but the researcher may define it in his own way—as an industrial area versus an agricultural area or as an area having certain facilities (transport, post office, hospital, electricity, water, school, market, security etc.) Therefore it was felt that the variables of a target group or a population characterizing it should be specified and not confounded into one global term.

## II A STUDY OF CHANGES IN PROFESSIONAL ATTITUDES OF STUDENT—TEACHERS

DR. S. P. AHLUWALIA

### *Objectives of the Study*

- (i) To investigate the nature and extent of changes in the professional attitudes of student-teachers of some selected

secondary teacher-preparation institutions of Uttar Pradesh,

- (ii) To make inter-institution and intra-institution comparisons in changes of professional attitudes,

- (iii) To study sex-wise differences in changes of professional attitudes of the selected student-teachers.

### *Design of the Study*

The study used a pre-test and post-test design. It was a pseudo-experiment with the teacher-preparation programme as a treatment. There was no control group.

A Teacher Attitude Inventory (TAI) measuring six professional components was constructed. The components were (a) Teaching profession, (b) Classroom teaching, (c) Child-centred practices, (d) Educational process, (e) Pupils, and (f) Teachers. The responses ranged from strong agreement to strong disagreement on a five point scale. The weights were 4, 3, 2, 1 and 0.

The maximum possible score was 360 and the minimum possible score was 0.

### *Sample*

The sample was drawn from 11 colleges located at Meerut, Pratapgarh, Faizabad, Jaunpur, Khujja, Aligarh, Agra, Allahabad, Kanpur and Varanasi. It included 311 (48%) males and 337 (52%) females. In terms of age, 96 were under 20, 519 in the age-group 21 to 30 years, 31 in the age-group 31 to 40 years, and 23 above 41 years of age.

### *Major Findings*

1. The mean-attitude scores, as a general rule, were found to decrease instead of improving at the end of the training programme

2. The one-year course of teacher preparation, run by different institutions

affiliated to the various universities and examining bodies of Uttar Pradesh, perhaps does not develop positive, healthy, and favourable professional attitudes in prospective teachers. If some attempt is made to develop healthy attitudes, it can only be labelled as unsuccessful and fruitless.

3. The mean attitude scores of admission-seekers to different institutions differ and their mean attitude scores either go up or go down as a consequence of the teacher-preparation programme run by a particular institution.

4. Sex is not a determinant for a differential of change in professional attitudes of student-teachers as a consequence of the teacher-preparation programme.

#### *Suggestions for Further Research*

Some areas like the following were suggested by the investigator for further research :

1. Attitudes of teachers at various levels—primary, secondary, college and university, can be studied to determine whether patterns of teacher attitudes vary at different levels.

2. Longitudinal studies can be taken up to study changes in attitudes of teachers over a long period of time under different types of training, working, or service conditions.

3. Impact of teacher attitudes on teacher behaviour in the classroom and student behaviour may be investigated.

4. Experimental studies of changes in professional attitudes of teachers may be undertaken. These should be rigorously controlled experiments with rigid experimental treatments and specified controls.

In the discussion it was pointed out that Attitude Inventory does not give reliable results because the subjects are

able to fake the responses. In highly urbanized cities, the trained teachers are exhibiting an attitude which is detrimental to the cause of education. For example, the teachers would like to retain only good students to show better results and would ask the academically poorer students to leave the institution. It was pointed out that the development of this attitude was due to educational management and administrative policies. Those teachers who produced better results were rewarded. Therefore, studies should be taken in the area of management and administration of the educational system and in the field of in-service training programmes for developing healthy attitudes in the teachers.

### III. SOCIO-PSYCHOLOGICAL INTERVENTIONS FOR UNIVERSALIZING EDUCATION

PRAYAG MEHTA

The paper had been circulated earlier and the main points were presented by the author.

#### *Causes of Wastage in Education*

From a study of about 50 investigations conducted in the last 25 years in the area of wastage in education, Dr. Mehta had classified the causes of wastage into two main categories : (i) socio-economic, and (ii) psycho-educational.

The main socio-economic cause has been found to be poverty, which resulted in the following three conditions :

- (i) Poor home conditions
- (ii) Failure experience
- (iii) Sense of insecurity.

All the three interacted among themselves.

The poor home conditions in turn aroused false consciousness, and the latter developed norms, values and attitudes which resulted in stagnation and dropouts. The sense of insecurity in turn led to nutritional and cultural deprivation, and the latter led to parental and children's sympathy towards education, which finally resulted in stagnation and dropouts. There was also interaction between the above factors.

The psycho-educational causes stemmed from the system of education : (i) curriculum and textbooks (ii) medium of instruction (iii) examination system (iv) administration and management (v) absence of pre-school education.

The system of education affected the psycho-cultural nature of children and teacher attitudes and values, both of which resulted in stagnation and wastage.

#### *Need for Interventions for universalization of Education*

Dr. Mehta, in his paper, highlighted the need to devise and implement effective interventions to bring about universalization of education. Merely providing free and subsidized textbooks and educational material, providing free mid-day meals, etc. was not enough.

There is a need to take a fresh look at the entire system of educational administration as well as the system of administering social change and development programmes. There is a need for promoting large-scale participation of the pupils themselves in the task of organizing and energizing education for them. Involvement of the pupils in this process can itself become an instrument of mass education.

The system of education has been for long associated with large-scale failure at examinations. The time has come when

the basic difference between educating and failing should be understood. The power to fail the child and to prevent him from going ahead cannot be considered an act of education. It certainly does not tell the poor child to achieve what he needs so desperately—success experiences. Therefore, education has to be elevated from being a classroom ritual to becoming an important social process. It has to move from being a single shot lottery to becoming a continuous, lifelong process and an instrument of social and individual development.

The teacher-training programmes should lay emphasis on the development of attitudes and personality of pupil-teachers to perform the task of teaching. A teacher who ridicules a child about the disadvantages of his home by such remarks as, "How could he study when his parents never studied" is contributing to wastage in education.

The curricula and books also contribute to stagnation. An important educational principle of children's learning, that the curriculum should be new but not so new as to arouse anxiety, is grossly violated. The content and concepts, the curricular mix and load, methodology of presentation, integration of life experiences with newer material—all these need education both for use in formal classroom lessons, as well as in non-formal educational programmes.

#### *Need of Notable Interventions*

The need of interventions was highlighted. A reference was made to two major programmes which are underway.]

(i) A massive programme for functional literacy being carried out by the Ministry of Education.

(ii) A non-formal education project in Bhumiadhar.

Both these programmes have indicated how socio-psychological intervention can reduce wastage in education.

In the discussion some other types of interventions were suggested—change in teaching methodology, teaching models, guidance services etc. It was also suggested that education was not regarded as a value and if somehow it could be linked up with the raising of economic standards, which were concrete, immediate

and feasible rather than indirect and distant as they happen to be today, the wastage in education could be considerably reduced.

Prof Rawat gave a detailed description of the Non-Formal Education Project.

It was concluded in the end that there was an immediate need for introducing intervention measures to remove the causes of wastage and stagnation through action programmes □



## Universalization of Elementary Education : Some Suggested Areas of Research

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PRAYAG MEHTA

SOME theoretical and practical issues regarding socio-economic deprivation, wastage in education and the problem of universalization of education have been discussed elsewhere.<sup>1</sup> The following broad areas of research, along with some topical details, are suggested in the context of conceptual models presented in the above paper. The specific topics are only suggested as illustrations. Some other similar topics may also be considered in the given area of research. Each problem will require a detailed research design and strategy. However, all the suggested areas and topics of research aim at creating knowledge and practices of effective intervention for dealing with the problems of wastage in education and for accelerating the tempo of universalization of elementary education and of adult literacy.

### 1. *Social Transformation of Marginal People through Non-formal Education*

This project should be launched in some selected areas for the education of rural labour, bonded labour and such other weaker sections of the rural society. To begin with, the project may include adults in the age group 15-25 and children in the age group 6-14 years with provisions for some work with children below 6 years and some other categories of people above 25 years. The project should help people develop various skills for organizing themselves in order to take active part in the various developmental activities. They should be involved in thinking and planning such activities, and in making attempts for procuring credit and other material facilities needed for launching some viable economic projects in their respective areas. Such people should be further involved in planning and carrying out non-formal education for children in the age group 6-14 years. Some specific sub-

<sup>1</sup>Prayag Mehta, *Socio-Psychological interventions for universalising education: A case for radical social transformation and non-formal education*, New Delhi : National Labour Institute, 1976. (Mimeo.)

jects of research under this area are as follows :

- (a) Organizing education camps for rural labour; developing consciousness, a desire for assertion and a sense of social efficacy among them. Such camps will also be organized specifically for women.
- (b) Development of a desire and skills for self-employment. Attempts at developing entrepreneurial behaviour and skills. This can again be organized for both men and women
- (c) Developing participation of the concerned people in thinking about projects of self-employment and their implementation. Functional and social literacy will be developed in these projects
- (d) Working with development administrators and support systems such as rural banks for reorienting their attitudes and images and development of skills for supporting on-going activities and initiating new projects.
- (e) Mobilization of local resources and other external economic inputs for launching small projects. Literacy programmes will centre round such inputs. Involving children in the age group 6-14 in suitable ways in various activities of the project. A non-formal education strategy to be developed for integrating the psychological needs of such children and the requirements of the socio-economic development programmes visualized in the project.
- (f) Developing interface between parents and children using one

for the education of the other and vice-versa

- (g) Development of suitable training and educational materials, including some broad themes for a curriculum for such a project.

## 2. *Research Designed to Improve the Efficiency of Formal School System and Institution Building*

Such a project can be launched in one selected district with the main objective of improving the general efficiency of the school system. This should aim not only at elimination of wastage but also at continuous motivation of human agencies and improvement in the quality of education. Teachers, pupils and administrators in such emerging school complexes should also be used for non-formal education of the community. Some specific projects suggested in this area are :

- (a) Development of morale and motivation of the human agencies.
- (b) Restructuring of administration and management of the system.
- (c) Utilization of local and community resources for reinforcing the work of the school.
- (d) Developing school-community interface.
- (e) Developing suitable intervention strategies where teachers, pupils and other school administrators can be used for launching non-formal education of the community—most of the parents and children in the school.
- (f) Increasing participation of the concerned people, including teachers and pupils and parents in reforming and formulating formal school curriculum.
- (g) Using the emerging experience in

such a project for training of teachers and for development of suitable cadres who will eventually become facilitators of non-formal education

### 3. *Collection of Themes and other Materials for Development of Socially and Cognitively Relevant Curricula in Elementary Schools*

In order to provide elementary education to young children in the age-group 6-11 on the principle of "new and should not be so new" and on the principle of overlap in the field of experience of the children and that of the experience implied in the textbooks as taught by the elementary school teachers a continuous search of relevant themes is needed.

Such a socially relevant and cognitively acceptable curriculum may also be found useful for non-formal education programmes for the concerned people. All such materials should be tried out and tested in formal and non-formal education situations. A new approach to curriculum development and teaching may follow.

One of the main difficulties which the culturally deprived children have to face is the bias in curricula and textbooks. The following researches are suggested for remedying such a situation.

- (a) Collection of themes concerning the life and culture of the local community.
- (b) Search of folklore, folk stories and such other traditional materials with a view to identifying relevant themes. The effort here should be to develop materials which may reflect fields of experience of the local community and their children.

(c) Talented persons at the local level should be identified to work as facilitators and consultants in such a collection of themes. The same persons can be trained to work as part-time teachers for the younger children.

(d) Some experiments for developing educationally sound pre-school experience for the deprived children. Use of traditional and mass media for this purpose. Involvement and education of mothers will be an important part of this project.

(e) The inventory of themes to be used for developing a thematic dialogue and education of the concerned illiterate adults. Such an attempt will seek to integrate the adults for non-formal education of parents and their children.

### 4. *Entrepreneurial Development of Rural Labour and Marginal Farmers*

As a part of the socio-economic development of the poor people, various kinds of products are being introduced in order to create employment and self-employment for them. The conversion of an agricultural labour or a small farmer into an artisan or a small entrepreneur is indeed a qualitative development in the psychology of the concerned people. It will be worthwhile therefore to take up a project for developing entrepreneurial behaviour among such target groups. The following studies are suggested:

- (a) Procedures for identification and selection of potential entrepreneurs.
- (b) Training of such entrepreneurs.
- (c) Development of suitable materials for training.

- (d) Development of a support system in order to reinforce the successful implementation of small entrepreneurial activities in villages. The agro-industrial development corporations, the emerging rural banks and other credit giving agencies should be invited to collaborate with educational agencies for launching such a project.

#### 5. *Workers' Participatory Education and Involving Workers in their Children's Education*

A comprehensive project for promoting skills of participation among workers and for promoting actual participation in industry and management. This will be an attempt to use the industry as well as workers education agencies, including polyvalent institutes for promoting education among children and their parents. This will be particularly relevant for industrial slums in large metropolitan cities like Bombay and Calcutta. The project should aim at developing socially conscious and active cadres for working as facilitators on spreading education among other people, particularly the eligible

children. Thematic approach should be tried for promoting education for social consciousness and participation.

Some specific projects in this area are suggested as follows .

- (a) Use of industry as a school for workers, promoting skills of participation and actual participation with a view to develop consciousness and efficacy among them.
- (b) Non-formal education of workers in general. It should include programmes of literacy as well as programmes of skill development.
- (c) Involving workers in non-formal education of their eligible children.
- (d) Development of suitable themes and curricula for education of parents and children.
- (e) Education and development of socially conscious and active cadres to work as facilitators of non-formal education among parents and children. A thematic approach to such education. □

# Priorities for Research in Education

## Context for the Definition of Priorities

SUMA CHITNIS

THE issue of priorities for research in education can be considered from several vantage points. The definition of priorities would of course depend upon the vantage point taken. For instance there would be one set of priorities if the focus is on research aimed at developing pedagogic techniques, another if the focus is on improvements in the administrative structure, a third if the focus is on meeting the objectives of mass education, and so on. Taking this fact into consideration it is important to specify the vantage point from which priorities for research have been identified in this paper, viz., the terms of reference for one of the Task Forces set up by the Educational Research and Innovations Committee (ERIC) of NCERT to advise the Council on research priorities. This Task Force was specifically required to spell out research themes that would contribute to solving the problem of *"how education can be made more relevant to the socio-economic needs of the country"*.

Paragraphs 4.3 and 4.4 of the document entitled NCERT RESEARCH SCHEMES

1975 provide specific guidelines in terms of which the themes for research aimed at making education "more relevant to the socio-economic needs of the country" may be defined. Since the research priorities set out in this paper have been identified with reference to these guidelines, it may be pertinent to quote these paragraphs by way of an introduction to the statement of research themes that follows :

"4.3 How education can be made more relevant to the socio-economic needs of the country is another important area of research. Research investigations and innovative projects in this area will be encouraged to find out how the existing educational structure and content can be altered, enhanced and modified to bring about faster economic growth and social change. In this connection research programmes on problems like lifelong/recurrent education and self-reliance education and social mobility, strategies of human resource development, area studies of growth and development-oriented educational structures, optimum allocation of resources within education and between

education and the rest of the economy, studies in educational finance, administration and planning, including management of systems and cost effectiveness, will receive support.

"4.4 The above examples are illustrative of the important problems which require immediate attention but which have possibilities of contributing to the knowledge and understanding of educational processes, human development and many other things which contribute to the educational development of a society. The problems of the classroom, the teacher and the students, educational administration, and supervision, child development and processes of learning, changing culture and values, etc., which are no less important in improving the quality of instruction will also receive support, but the quantum of assistance will depend on the relative weightage given in terms of the priorities mentioned above".

The research implications of the objectives defined above are as follows :

*I. Identification and specification of the socio-economic needs of the country, particularly in terms of the qualities, skills and attitudes to be developed through education.* For instance egalitarianism, secularism, nationalism, integration are some of the qualities that may be considered to be "needed" by Indian society. Thrift, productivity and capacity to innovate, to identify resources, to utilize them to their optimum capacity without wastage, are some of the qualities that need to be developed in order to fulfil the needs of economic development. Other socio-economic needs require to be identified.

Further, all these needs have to be spelt out both in terms of structural changes called for in Indian society, as well as in terms of changes, in terms of

the qualities, attitudes, values and capacities required to be cultivated among Indians as individuals.

*II. Working out the operational implications of gearing education to socio-economic needs and to the ideal of quality.* For instance it is necessary to examine ways and means of promoting secularism, and nationalism through the process of socialization at school and college. Similarly it is necessary to examine existing practices and procedures, for instance practices pertaining to the financing of education or the existing permissiveness regarding variations in standards of equipment of schools and colleges and to spell out the kind of policy reforms and innovations that are required in order to ensure that education is geared to the socio-economic needs of the nation.

*III. Making systematic analyses of the existing system of education with a view* (a) to understanding its structure and working with reference to requirements as spelt out in the context of II above, (b) to identifying the lacunae, gaps, and shortcomings in the system in terms of its capacity to contribute meaningfully to the socio-economic needs of the country.

*IV. Conception of programmes, directed towards* (a) the operationalization of goals and (b) visualized with reference to I and II above, and the bridging of the gaps between the existing system and the goals visualized. The development of model schemes and programmes, designed for specific regions in consideration of the specific local socio-economic needs and potentialities of these regions.

*V. The launching of action research and evaluation programmes.* While each of the five implications listed above define

five distinct tasks in terms of which research areas and themes may be defined, the themes themselves may not fall neatly under one or another of the points specified. Rather they are likely to cut across two or more of these basic concerns. The following is a list of nine areas, together with specific themes under each area, that deserve priority from the vantage point of the concerns voiced inspecified above

#### DEFINITION OF PRIORITIES

*Area No 1 : Conceptual analyses of the socio-economic needs of the country*

The preparation of a series of thematic

papers defining the socio-economic needs of the country both at the national and the state level and at the level of administratively viable units such as the districts within each state. To be truly useful, such papers must be based on statistics, research studies and other data regarding the socio-economic situation in the country. Plan documents, statements on socio-economic policy, and other documents reflecting thinking on development for India must systematically be drawn upon for the preparation of these papers

*Area No 2 : Analysis of the education system as it functions today : Its relevance to economic development and to social change.*

#### A. Analyses of:—

- |                             |   |   |
|-----------------------------|---|---|
| (a) the content             | at different levels of schools (primary, secondary) & the different levels of higher education (graduate, post-graduate, doctoral etc.) | to indicate whether or not, and if so how, the content and process of education contribute to factors such as _____ |
| (b) the process of learning |   |   |

↓  
(a) at the personal level

1. Self reliance.
2. Individuation.
- 3 Capacity to earn a livelihood/contribute to the economy
- 4 Ability to identify and to solve problems relating to real life skills, professional expertise etc for the purpose.
5. The productivity of a worker to efficiency and adjustment at work
6. Awareness of the social situation, a sense of civic and social purpose.
7. Political awareness and a sense of political responsibility.
8. Other qualities relevant to socio-economic development.

(b) at the societal level

1. Integration
- 2 Secularism
- 3 Democracy
4. Economic development/in terms of increased productivity
5. Modernization and change in the direction of development in such terms as the concept may be defined in exercises conducted under Area I above.

*B. An identification of the shortcomings, imbalances and inequalities in the present system of education*

(i) A probe into non-fulfilment of educational targets and the identification of factors responsible for non-fulfilment.

(ii) Correspondingly, the detection of over-shooting of targets—an identification of the factors responsible for this and an analysis of the implications of this (e.g. in terms of the unemployment of graduates, the migration of the educated elite and their absorption in the world market etc.)

(iii) The identification and description of imbalances in the growth of education (in the provision of facilities and expenditure, in enrolment etc.)

Imbalances could be in the form of : levels achieved/provided for; in the variety of courses made available; physical plant and personnel facilities provided etc. There could be imbalances both in the quantity and quality of facilities provided—likely to appear as inter regional or interstate imbalances at the national level, inter-district differences at the state level, also, as imbalances between the sexes, between different religious groups, between castes (particularly the “backward” castes and the “higher” castes), or between rural and urban areas both at the national and the state level. It would be useful enough to identify these imbalances, it would be even more valuable to probe into the factors responsible for these imbalances, and to develop some thinking on measures for their elimination.

*Area No. 3: The management and administration of education : The formal system*

(i) Analysis of the structure and the organisation of the education system of the country, with a view to examining whether the structure is suited to the

objective. Is there too much centralization and too little autonomy? Are there satisfactory linkages between the various levels of education—viz. primary, middle, secondary and district level planning, organization and administration of education? Are structures of the different stages disparate? Is the system as a whole well-integrated?

(ii) The school, the college and the university as systems. Organization studies oriented towards developing insights for the more effective management and administration of these organizations.

(iii) What are the different types of managements that manage schools and institutions of higher education today? An analysis of each type of management (govt., private, missionary etc.) with a view to examining their goals, objectives and operation, and their effectiveness and efficiency in the achievement of goals relevant to the socio-economic needs of the country.

With reference to Areas 3 (i), 3(ii) and 3(iii) listed above, there should be a special focus on :

- (a) Minority Institutions—An analysis of minority rights in education, and of the implications and consequences of these rights.
- (b) Government Institutions—An analysis of how their management, organization and administration is different from others.
- (c) Comparisons between Rural and Urban institutions and
- (d) Elite and non-elite institutions—with a view to understanding differences in terms of facilities they provide, skills and qualities they develop, behavioural norms they encourage, political attitudes they promote, economic aspira-



tions they cultivate and the culture they breed.

(iv) How is policy in education formulated? To what extent are teachers, administrators and managers of education aware of policy and its implications? How does awareness or non-awareness of policy on the part of these persons affect the effectiveness of education? An analysis of some of the recent policies in education, their implications and their consequences

Specific focus on :

(a) "The 10+2+3," (b) New University Acts, Codes of conduct for teachers etc., and (c) Impact of the curricular load (in hours and the amount of information contained on educability, of (i) talented (ii) ordinary, and (iii) backward children.

(v) Relationship between directed use of leisure : and

(a) academic performance

(b) creativity.

(vi) The optimum starting age and period of exposure for primary school children

#### *Area No. 4 : The financing of education*

(i) What are the patterns of the financing of education in the country? What are the relative shares of the public and the private expenditure on education? What are the sources from which the funds for both kinds of expenditure are drawn?

(ii) What kind of rights do the financiers of education (both public and private) exercise on educational policy? On the management, organization and administration of education?

(iii) What are the ways and means of optimizing resources available for education? What kind of economics is it possible to affect? Are there any alter-

nate sources from which resources for education may be drawn?

It should be possible to organize a whole range of studies around this issue. The studies should aim

(a) at analysing current patterns of financing for and budgeting in education, with a view to identifying wastages and suggesting economics.

(b) at developing techniques and models, for analysing costs in education and for the preparation of blueprints and budgets based on unit-costs

(c) at developing models and action studies, both in the rural context and urban context for literacy and primary school education programmes that operate at low-cost but which nevertheless fulfil the basic objectives of education.

#### *Area No. 5 : Education and social mobility*

(i) An analysis of how far education makes for occupational and social mobility: Is education an equalizing agent at all? Is it a major determinant of social status? If only a minor variable, what are the major determinants of status and mobility in Indian society?

(ii) An analysis of the economic elite, the political elite, the professional elite, and the administrative elite with a view to understanding the extent to which education has contributed to their status.

(iii) Identification of factors that make for good performance on the part of students who excel and poor performance of students who do not do well. Studies on social class and other background factors and performance in education

(iv) How is excellence of performance

in education defined? To what extent is excellence in performance as defined in education related to success in terms of personal achievement? To what extent is it related to the ability of individuals to society? How is backwardness in education defined? What are the disadvantages of educational backwardness to the individual and to society?

(v) Analysis of learning problems of under-privileged students.

*Area No. 6 : Innovations in formal education*

(i) Research into new modes of organizing education, administering educational institutions, teaching, evaluation etc. with a view to developing techniques and strategies

- (a) for handling the problem of mass education.
- (b) for obtaining within the education system the dynamism that is required to ensure that education is relevant to the needs of the country.

(ii) Adoption of experimental projects relevant to surrounding milieu of the school.

(iii) Research into improvement of the teacher and his teaching methods.

- (a) Action research into teachers' use of new material.
- (b) Action research in motivating the teacher to interact with the surrounding community.
- (c) Use of non-professional teachers as substitutes for professionals.

(iv) Experiments in partially de-formalizing the formal system through introduction of flexibility of schedules and emphasis on creativity and innovativeness.

(v) Action research along with documentation for assessing and eliminating

the growth of parochialism and other evils that could sometimes be spread through adopted curriculum.

(vi) Experiments in building the community and teachers leadership in planning syllabi including co-curricular activities linking the school to its environments.

(vii) Institution building research with particular reference to development of community and teachers leadership and development of general ethos in a school system in order to bring education closer to nation-building activities.

*Area No. 7 : Non-formal education—particularly education for the deprived*

(i) Conceptual analysis of what exactly is meant by non-formal education, what are its advantages vis-a-vis formal education? Are the costs of non-formal education less than the cost of formal education?

(ii) A descriptive analysis of some of the ongoing experiments in non-formal education in the country—particularly with a view to examining their replicability and extend ability. These analyses should focus on :

- (a) Documented studies of successful schemes which were not or could not be replicated, with a view to identifying problems of replicating experimental projects.
- (b) Specifying the social costs and benefits of a selected scheme of non-formal education
- (c) Investigation into the acceptability of selected programmes to employers or other bodies likely to co-operate in schemes for non-formal education

*Area No. 8 : Innovations in non-formal education*

(i) Development of curricula based

on educationally valid and socially relevant themes for non-formal education, experimental implementation of these curricula and evaluation of the outcome.

(ii) Experimentation in the training of local level leaders and other human resources for launching interventions to battle with backwardness and inequality in education—Evaluation of the outcome.

(iii) Absorption of inputs from the formal school system for non-formal education.

- (a) Use of professional teachers for non-formal education
- (b) Adoption of teaching aids available in a school for non-formal

education in its surrounding area.

- (c) Participation of National Social Service Volunteers and of school children as young teachers in the community

—Evaluation of the outcome.

#### *Area No. 9: Specific issues*

- (i) Tensions in educational institutions
- (ii) Apathy in educational institutions particularly colleges of Education.
- (iii) Disaffection among teachers
- (iv) Student unrest/apathy.
- (v) Corruption in education, etc.
- (vi) Problems in the implementation of innovations and reforms. □

# Causes behind Poor Quality of Scientific Publications and Textbooks

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B. SIIARAN

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*The paper analyses the causes behind poor quality of scientific publications, with special reference to textbooks. In scientific publications, this is attributed to the priority given to quick returns, increased Ph. D. enrolment, and absence of field-oriented problems. The problems coming from defence (Radar School of Research) and atomic energy (Bhabha Atomic Research Centre) are likely to improve the quality of scientific publications. In the case of textbooks, the production aspect suffers because of emphasis on low cost. The content suffers because of the absence of well-defined operational guidelines, difficulty in finding an author conversant with all the problems, a syllabus instead of a curriculum guide forming the base for writing, constraints of time and resources etc.*

Whether the treatment should be based on the teaching-learning situation or it should be exhaustive is a vital question. Lack of pre-testing or feedback, and the cut and paste attitude of transplanting material from abroad such as PSSC, Nuffield etc. are also to blame. A lot of research on concept formation, grade placement of concepts and rate of learning will have to be done before a quality textbook can be produced.

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In a fair evaluation, a textbook should be evaluated against its objectives

## *Introduction*

Scientific publications include periodicals and books. The periodicals include science journals, magazines, reports, reviews etc. The books include textbooks, textual material, popular pocket books, treatises etc. We shall, however, focus attention only on the quality of publication of journals and textbooks.

## *Journals*

The criteria for a good journal are regularity of publication, quality of

work, accuracy in printing and diagrams, directness, the quality of paper used, and the get-up. The last two factors are the least important. For example, *Compte Rendus* and *Nuovo Cimento*, the former a French publication and the later Italian, use bad paper. The get-up is unimpressive. Yet both are considered to be good journals.

The regularity of publication is determined by the adequacy of staff, co-operation of referees in sending comments in time and the press schedule.

The quality of work depends on the system, its capacity of work and attitude. The system here refers to the institution, its environment and the worker.

Accuracy in printing and diagrams again refers to the production aspect of a journal. Good journals have tried to solve this problem by having a good editor and a draftsman who prepares all the diagrams to the desired quality. The conciseness of language depends on an individual's style. Not much can be done about it except for giving exhaustive guidelines.

Well-formulated problems are more available in *field-oriented* research. Our hopes in this regard are pinned to institutions like the Radar School of Research, Bhabha Atomic Research Centre etc.

With a large number of fellowships becoming available with CSIR and other organizations, particularly after 1962, there had been a sudden increase in the enrolment of students for Ph.D. and in many cases beyond the capacity of the institutions or individual supervisors. This led to a fall in standards. At some places the enrolment went up by a factor of 10 or 20. Where there used to be five or ten research students, one may now find 100. Many of these join re-

search not for academic pursuit but because fellowships are more paying than lecturerships in many colleges. With Ph.D. becoming an essential qualification for becoming a university lecturer, there is going to be further increase in enrolment and consequently, further dilution of standards.

The problem is further aggravated by the attitude of quick returns, whether it is for getting a Ph. D. or a promotion. This makes research repetitive in nature, having little or no relevance to the Indian scene. If Mr. X has worked on some property of sodium chloride, Mr. Y may work on potassium chloride, and so on. For a multiplier effect, very often papers are fragmented or published in different journals, with little difference in the contents. Sometimes a paper which cannot be published in any foreign journal stands a good chance of being published in India. This is because our referees are afraid of being identified and tend to be liberal to avoid future embarrassment.

### *Textbooks*

The problem of textbooks has been dealt with by Joshi, Singh and Hans in a conference held at Srinagar in 1970. They have, however, confined themselves to the problems of undergraduate and post-graduate-level textbooks in physics. The present paper is more concerned with the quality of school level science textbooks.

### *Production aspect*

The quality of a textbook depends on the investment. In India, textbooks have to be produced for the poor. Whether the books are to be purchased by the poor, or are to be supplied free, the cost has to be kept low. This results in

(a) use of poor quality of paper, (b) avoiding multicoloured printing, (c) production of paperbacks instead of paper-bound editions, (d) limiting the size of the book, in terms of pages and words, and (e) use of a small number of illustrations. To maintain the sharpness and line thickness in diagrams, all the diagrams should be reduced by the same factor. Translation from English to Hindi and other languages poses problems. The block which is used for lettering in English cannot be used for Hindi or any other language. The cost factor is a deterrent. This leads to unnecessary distortions due to displacement of words and drawing of additional arrowheads to indicate them. In some cases it may also affect the print size. The efforts of national agencies like the NCERT have resulted in about 50% reduction in the cost of books. For instance, a book published by the NCERT may cost Rs. 4.50, the same book, when produced by a private publisher, may be priced at Rs. 8 or more.

#### *Content aspect*

What is a good textbook? A lot can be done in this direction. The available *guidelines* (Dave 1972, Pritam Singh 1973) are not in a crystallized form; they are mostly encyclopaedic and so fail to be operationally effective. In the absence of well defined operational guidelines one can imagine the fate of the quality of textbooks.

A good author should know the abilities and skills to be developed through each topic. He should be good in content, methodology, level of presentation, theories of rate of learning, communication skill, sense of proportion, where to use a figure, line diagram or a photograph. For example, *Textbook of Heat* by Rajam is better than the textbook on

the same topic by Saha and Srivastava in terms of diagrams. An individual is unlikely to possess all the qualities. Some may be good in methodology, but not in content and vice versa. Some authors may also suffer for lack of resources, like inadequate library facilities and resource materials, etc. Some good authors may not undertake writing because terms are not sufficiently attractive. Doing a Ph. D. thesis or writing an original research paper commands greater respectability than perhaps writing a textbook. In some cases, particularly for the degree and higher stages, the sales may be insufficient to justify the labour. This is why people focus more attention on writing school books—they are monetarily more rewarding. The NCERT has therefore taken recourse to *team work*. For every textbook from the middle stage onwards, the NCERT has an editorial board consisting of eminent subject-specialists who either themselves write some portions of textbooks or suggest authors to do the job.

The *curriculum guide* rather than the syllabus should be the basis for writing a textbook. Textbook writing based on syllabuses results in unnecessary distortions, undue weightage to certain chapters or sections in which the authors are interested.

There also occurs a transmission loss in translation from English to Hindi or to any other language. This may be due to translating even proper nouns like Mr. Fox, or inaccurate rendering due to poor knowledge of the content. For example, drop in pitch in Doppler Effect may get translated as "Dhwani Me Mandia" in Hindi, which actually means drop in *loudness* and not in *pitch*.

Greater the skill required, greater will be the investment in terms of money

and time. Many times the *constraints of time and resources* prevent the development of textbook writing as an art. For example, in 1974, the NCERT was required by the CBSE to write textbooks in science and mathematics for Classes IX and X. The books were written in a record time of about 2-3 months. The NCERT received praise for its efficiency but had to face a barrage of complaints about the quality, bulk of the book and printing errors, etc.

The decision in 1976 of implementing +2 with effect from 1977 by the CBSE is also likely to adversely affect the quality of textbooks. The decision is bound to swing in favour of fast writers who need not necessarily be sound in content and methodology.

Certain policy decisions also affect the quality of the textbooks. For example, should textbook writing be based on *teaching-learning situations*, or contain every word that is to be taught? The former may tend to be telegraphic, and the latter bulky and unreadable. The present NCERT books for Classes IX and X in science and mathematics are based more on teaching-learning situations.

The *pre-testing* of textbooks may also improve the quality. This unfortunately has not happened. There are some difficulties with pre-testing: (i) who would be the scapegoat? (ii) it requires a long-term planning covering 15-25 years before a change is brought about, or (iii) a system tends to stabilize for 3-5 years. In fact, the educational changes had been so rapid that some have started

saying that curriculum changes in India every year with the result that ideals and textbooks have been continuously drifting out of phase. With the firm decision of the Government of India about the implementation of 10+2+3, let us hope that pre-testing or refining textbooks, based on classroom feedback, would become possible after some time.

Lastly, the cut-and-paste approach, or the attitude of transplanting materials from abroad like PSSC, Nuffield, etc. has also considerably inhibited quality development.

However, evaluation of any book must be fair. Most of the textbooks were written with the sole purpose of helping the student pass in the examination. And the authors undoubtedly succeeded in that. The evaluation of books according to the criterion of development of certain abilities and skills is not justified. The book should be evaluated against the specific objectives for which they were written.

It may be remarked here that there is ample scope for the evaluation of nationalized textbooks, but there is little or no scope for evaluating books produced by commercial enterprises. The latter are only guided by a prospect of profit.

A good deal of research will have to be done on concept formation, grade, placement of concepts and rate of learning, before we could think of producing textbooks capable of developing desired abilities and skills. □

# Educational News

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## All India Educational Research Conference

November 1, 1976

INAUGURAL ADDRESS

SHRI J. P. NAIK

Member-Secretary, ICSSR, New Delhi

PROF. RAIS AHMED, LADILS AND  
GENTLEMEN,

I am very grateful to the NCERT for having invited me to inaugurate this conference. My regret is that owing to conflict between two seminars, for both of which I was committed, I shall not be able to stay with you for both the days of your deliberations. I shall, however, try to follow them, and do whatever I can to help your objectives. When I was thinking of the theme I should deal with in this inaugural address, it suddenly occurred to me that I have been connected with and trying in my own way to promote research in education for the last 30 years. Some of the activities which we began have now been taken over by the NCERT and developed much further. For instance, you will remember that we in the Indian Institute of Education started the *Journal of Educational Research*, the

first Indian journal of its kind, in 1949, but we could not run it well because of financial difficulty. But I am very happy that the NCERT is now running the *Indian Educational Review* which is one of the best journals in the area and the best in our country. I was also instrumental while working in the Ministry of Education for initiating the scheme which has now been taken over by the NCERT and which I find has developed very well, i.e. as many as 80 research projects are under it. I have also been trying to develop research in education, and thought I might share with you my experience of promoting educational research over the last 30 years so that it could give you some guidelines for further action. Let me begin with one statement which is not very flattering. When we began in 1948, educational research was in its infancy; its quantity was extremely inadequate and its quality was not very happy. I do not think it has travelled very far from its position of infancy in spite of the lapse of 30 years. Even today one cannot deny that the quantity of educational research is still meagre, at least, far too inadequate for our needs and purposes. And its





Director, Prof. Rais Ahmed (centre), and Joint-Director, Prof. Shib K. Mitra (left), attending the Conference

quality leaves a good deal to be achieved. But this does not mean that we have not made any progress at all. But I am not quite sure that the progress is commensurate with the period of 30 years or with reference to the resources at our command. I would like to analyse this position to some extent,

My next point is that educational research has to be considered at three levels. The three levels are very distinct. The personnel, the type of research at each level, and the problems, which are all different. You cannot really develop a common policy to cover all the three. The first and highest level of educational research is sophisticated research, which can be developed at the university level, provided you make a good deal of input from the social and natural sciences and not rest-

ict it to education alone. Education, like agriculture; is basically an inter-disciplinary thing. Education, agriculture and health are absolutely inter-disciplinary. There is no single discipline which can take care of our problems. You cannot really develop the most sophisticated research unless you bring the other social and natural sciences together. A thing like research on memory, you cannot do unless you bring a psychologist and an electronics and computer man together, and this is a level number one. In 1948, this was non-existent. Education had no status. Other social and natural scientists looked down upon it. [Shri Naik referred to the case of Dr. Sadashiv Misra who concealed his B.T. Degree]. In that sort of an atmosphere, inputs from other sciences were almost nil. During



A part of the audience

the last 30 years, this situation has changed considerably and I must say a good deal of the credit goes to the NCERT. In 1948, school education was no business of the university education departments, but gradually the university professors involved themselves in preparing curricula, writing textbooks, and thinking of school education problems. These things are very welcome. Over the last 30 years other departments, prestigious natural and social sciences departments in the universities, have been awakened to this awareness. Personnel in the field of education were few and far between [Here Dr. Naik referred to the case of Rajasthan University where the post of Professor of Education has still not been filled up]. But I must say that we have come a long way and these efforts will have to be continu-

ed in spite of difficulties. It is only in this direction that we can ever develop a highly sophisticated and important research which requires an inter-disciplinary approach and which can be developed at that level.

The second level existing in 1948 was research done in the training colleges and university departments of education. In fact, at that time there was almost a monopoly of research in education in the training colleges and university department of education because they thought that any other department going into this would be an intrusion upon their rights. These departments and training colleges had several handicaps to promote educational research. These handicaps still remain and even today the quantum of good research done by training colleges is still limited and it is still a fraction of the total. A

good question for heart searching for all the training colleges and departments of education is why this has happened. The personnel, organization etc. may be responsible. But we shall have to find an answer to this question and vitalize our training colleges and university departments of education. Their initial mistake was one of limiting their programmes almost exclusively to the training of secondary school teachers. Later on, they expanded their programmes to include not only secondary school teachers but also the trainers of secondary school teachers, i.e. the M. Ed. holders. The whole perspective still remained limited unless they could somehow transcend this. I do not think we will do very meaningful research on teacher education. Research on teacher education is far more extensive. The proportion of available resources spent on it is much more. I do realize the importance of teacher education but there are many other aspects of teacher education on which we should concentrate.

The third level I attach considerable importance to is research done by practising teachers at the school level. And I think the results have been most disappointing. In 1948, we started with two statements. Statement 1: there are no school teachers, secondary or primary, who are doing any meaningful research. This was a factually correct statement. The other statement, which was probably wrong, was that secondary and primary school teachers would not do research. They are consumers of research and not producers. They can at the most try to help learned people identify problems. The university professor assumed the role with regard to secondary and primary school teachers as that of the doctor to

the patient, i.e. you tell me what is wrong with you, it is for me to diagnose and prescribe the medicine. You have to swallow the medicine I give you. This had been the attitude for a long time. We tried to break it up. Experimentation and innovation can only be done at the school level by practising teachers as a form of research. It may not be sophisticated research but not all research is of the same type. There is no reason why experimentation and innovation in which we would like all teachers to engage themselves would not be considered a type of research, even a very important type of research. This is a question really of conceptualization. You call this or do not call this research. Experimentation and innovation, under the umbrella of educational research—encouraging the teachers to do experimentation and innovation, is essential. It means talking to them, discussing with them through seminars and workshops as to what type of educational experimentation and vocationalization can be introduced, helping them to introduce new ideas, finding small funds where wanted, bringing their results to light and publishing some of the best of them. I am very glad to say that the NCERT started the programme of Seminar Readings [to this Prof. Rais Ahmed added that it was still going on] where a number of teachers were brought together, and their papers on experimentation were read out and discussed, and ultimately came out in the form of a book, and was very often attacked by pedants. This is one programme we would like to develop in a very big way, which the SIEs should do at the state level, and identify at the state level. Further scrutiny should be done at the national level. I do feel that this third level is something where educational

research has to be experimented and encouraged.

What are our problems as we have faced them in promoting research? I feel the first and a very basic problem has been to involve an adequate number of people, talented people from various disciplines to take up educational research. This continues still to be the main problem. The quality of educational research will clearly depend on the type of people you involve. The quantum of good research will depend upon the number of people working on it. The basic questions are— to what extent have we succeeded and what shall we do to succeed in attracting good, talented people from important disciplines, social sciences and natural sciences to take an interest in education? This is the basic issue.

I have found two or three things. Firstly, Dr. Kothari and I started in the Fourth Plan with the idea of establishing research units in good university departments. For example, we supported the proposal of a sociology research unit in the Tata Institute of Social Sciences. We supported a proposal for economics of education in the University of Bombay. We wanted to suggest to set up at least one unit on the philosophy of education but the proposal never came. These units are too few. To evaluate them properly we need many more units. Just establishing one here and there will not do. We may have two or three units in each field, so as to enable some exchange of ideas, build up a minimum critical size of research workers. Whatever experience we have had with the setting up of these research units has been encouraging and I would like this to be encouraged further. We should select training colleges and university departments of education to develop such units. I was very happy

when Prof. Gayen took up a study of examinations at the IIT. There was criticism: what has the IIT to do with the matriculation examination? The whole point was to involve these prestigious institutions. I think we have made a good beginning but it is far too inadequate. These attempts will have to be continued.

The problem here is a problem which still exists, which we will have to tackle on some different lines. When you ask a young sociologist or a political scientist or an economist to join a unit of research in education, I find he is very reluctant to do so, for the very simple reason that he gets cut off from his parent department. He will never be able to go back to his discipline and he will lose all his contacts. Even in the units, it is difficult to get the right type of people. I think we should adopt a humbler approach. Instead of asking people to devote all their life to the study of educational problems, can we not ask them to devote three or five years and go back to their disciplines? I think the programme of fellowship for a limited period for which they commit themselves to work on a specific problem is more likely to succeed. This is an idea I would leave for the NCERT and UGC to explore further. In the USSR I have been examining this. In the last seven years, we have been able to give five fellowships and in all these cases results have been very encouraging. But five is a very small number for the disciplines to be covered. I think, for sophisticated research at the type-A level, a further implication in the expansion of the scheme what Dr. Kothari initiated in the fourth Plan—establishing research units and fellowship programme—is probably an answer.

The third point. We have good experience in the USSR of making nationwide studies. Four years back we made

a study of the education of Scheduled Castes and Scheduled Tribes on an all-India basis. The whole country has divided into 24 units and for each unit a social scientist was selected. In most cases they were young people, either lecturers or junior readers but they were not senior enough to have stopped learning further and brilliant enough to contribute a good deal to the study. We had an excellent coordinator in Dr. I.G. Desai and it took us three-four years and we now have a National Report. It cost us about eight lakhs of rupees, but it was worth it. Apart from the 24 states taken all over India, we got 24 young social scientists, for three-four years, and many of them are continuing their interest. This was a very great thing. The resources in the ICSSR are limited and nowhere are resources large enough to take up such studies. I now feel if the UGC and NCERT were to decide even to take up one major study of the problem, it should be for a year. A mere list of priorities does not help. The priorities have to be defined by institutions themselves, if you have one national level. It is a problem of great significance and relevance, in which all disciplines along with 15-20 social and natural scientists are involved. Then, over a ten-year period, you will have about 30 to 35 major problems studied. This will create a base on which we can build up our further development. This will create a pool of talent and ability. These are the ideas I want to express before you.

Another problem—how to develop good research in training colleges and university departments of education? I have not been able to achieve much. I am not the proper person to advise in the matter. What is the total contribution to research? Why is it so small?

What are the problems that are hindering this, and how can they be removed? There are around 300 training colleges for secondary school teachers, 1600 for elementary school teachers, 40 or more university departments of education. It is an immense resource and we spend a lot of money. Most of them do routine, mechanical teaching year after year. We should vitalize them by development programmes of research, link them up with the extension services/research and that attempt has succeeded to some extent. I am glad that the training colleges now look beyond their walls, go to the schools in the neighbourhood and give extension services. But research in training institutions is still in its infancy. This is a situation serious enough.

Coming to the last point of encouraging experimentation and innovation, I think that our investment in them is very little. Our system is inelastic and rigid and it does not permit such research. But there is an immense scope in this field and even a moderate allocation of resources for this purpose would go a very long way. But programmes have to be developed both by the State Institutes of Education and by the NCERT on a collaborative basis. The NCERT does convene conferences of SIES and I suggest this is a problem which should be discussed between them and some programmes initiated.

My last point—the focus of all the discussions for the last two days has been defining priorities. [Dr. Naik said that priorities have been defined in various places like ICSSR, etc. on many occasions.] But this exercise does not lead you anywhere. Dr. Kothari was very sceptical about this. He said that if a researcher does not understand what the priorities are and asks others, then he is not a good researcher. Another disad-

vantage is that when you declare priorities, you get numerous proposals from mediocrities and non-entities and proposals for poor researches. This exercise of priorities is very old. It will not take you far. (Dr. Naik gave the illustration of legal research on the land problem, declared a priority area.) Hardly any scheme came from the legal faculty. We organized a seminar of five weeks to which we invited social-economists, political scientists, anthropologists, where the problem of land in all its aspects was discussed. We have had two such workshops. I am happy to say that a number of good people got interested—we have been able to get five or six research proposals.

Another project in which Dr. Mitra is helping us is a psychological study of retardation. The problem of the handicapped group is of priority, but hardly any proposals were coming up. At our request Prof. Mitra and some of his colleagues have invited 40 psychologists and held a workshop of five weeks to discuss the problem, its concepts, approaches, data base, etc. This face-to-face discussion with young people will give us at least some problems. I think we have to be beyond a mere identification of priorities and attract people, and hold workshops involving them in a way in which the problems can be discussed further.

The second feature of priority defining is that we take up one priority itself and sponsor research on national-level study. Even if you select one national-level study in every state every year, which we shall sponsor, in the sense, we shall not wait for a proposal to come.

I have tried to put before you some experiences of the last few years. While we have a good research journal, where the research is published, one facility that is lacking today is that of abstracts

of good researches done. We have requested the NCERT from time to time for this facility. A separate journal of research abstracts is just not practical. We have requested the NCERT to add to its *Educational Review*—a section dealing with abstracts of good researches and findings done in India and outside. I think this will be another help to researchers.

#### ADDRESS BY

PROF. RAIS AHMED, DIRECTOR, NCERT

MR. NAIK, PROF. MITRA, PROF. R. P. SINGH and distinguished scholars and friends,

We have just heard a very interesting and a very stimulating talk by one of the best educationists in the country. There is no one like Mr. J. P. Naik in experience, in expression, and in his own very special style of encouraging others to take up the work where he leaves it. I am indeed very grateful that he agreed to give the inaugural address. The notice was short—and he is an extremely busy man and there is a great demand on his time, as he said himself there is another conference going on at this time and he has to keep himself here for addressing us. I am indeed very grateful that he has found time to make these very brief remarks. As you know my acquaintance with educational research is extremely limited and I have been looking at the problem only for the last few years. In 1974, we took a special measure. We thought that the research support provided by the NCERT to various organizations was piecemeal and paltry. We thought of setting up an Educational Research and Innovation Committee. We thought that we would

have to allocate much more money for research and that is why we strengthened the organization for examining the research schemes and tried to give some guidance to research workers as to what kinds of proposals would be most welcome by the Council. The response was not all too encouraging. Therefore, in 1975, in accordance with the regional idea, we set up these Task Forces, since we should not only support proposals that come to us but should try to identify which are the areas, and which are the weak areas, which are likely to be of great help to us for developing our own policies in the field of education, or in developing materials that are required by us, or such areas of weaknesses, where additional inputs are necessary. So we went in for the idea of Task Forces. We know such exercises have been done before and we are very grateful to Mr. Naik, who has brought them to our notice, particularly at this time, indicating that merely identifying priorities is not enough. Once we identify a set of problems and I would say that it is very important that we involve younger people in the game. You have to involve people by further seminars and discussions. Many of us with some experience have certain privileges, but there are many young people who come up and who can be a great source of help and ideas to take up new types of work. In the follow-up programmes of discussions and seminars, we shall particularly take care to invite younger research workers and new entrants to the field of education and hope that after these discussions, there will be some concrete formulations of problems.

As for national studies we also hope that seminars and workshops would lead to a better formulation of problems, and more experienced people could help in

developing a research design. And if research is done on a very important problem, in a very large number of places in India on a good design, then it is possible that all this research is compounded and enabled to lead to a very important statement of findings. I have realized that in the social sciences it is very difficult to be definitive of the studies. Coming again to the objectives, if your data were too little, what conclusions would you draw from it? If the research has been done on a large enough scale on a varied population in our country, I think the findings would be of great significance and relevance to our system. I do find that when foreign agencies draw up a scheme for research and sponsor research, they send certain designs and orient people who give our research workers very good data and information. Why cannot we have these national studies which are on problems of national significance? We view priority in that sense and simply in the sense that we would like to link the problems that are before us and simply draw the attention of research workers to these problems. I am very glad to say that the period of infancy of research in education seems to be coming to an end. At least there are symptoms and signals that this period is coming to an end. At this point Mr. Naik has stated that in 1948 it was in its infancy and the 1966 Education Commission had said educational research was in its infancy. The total amount of money which goes into educational research was of the order of rupees five lakhs or less than half a million Rupees. Now, if we look at the position today, Mr. Naik pointed out that circumstances are much better, and we have noted how we treated the question of people in other disciplines outside the narrow confines of education as defined

by the B. Ed. and M. Ed. courses. There are many hidden expenses, beyond the figures given by Mr. Naik. There is a lot of money which goes into university education. There are a lot of fellowships and scholarships which the UGC offers to departments of social sciences and they undertake some kind of research. In the NCERT, we have Regional Colleges of Education, we have the NRI departments which do a fair amount of research without reference to ERIC. We have made it a point that major research proposals of all the departments should come through ERIC—they are scrutinized with some seriousness. So the amount of expenditure has risen from rupees five lakhs to a much higher figure, probably five times as much. The suggestion of one per cent of expenditure made by the Education Commission is far from being achieved and a great deal has to be done. But I am glad that the UGC people have also run into the same problem—you cannot suddenly increase the funds. Besides, there are not enough takers. In spite of the money put at the disposal of the ERIC, there are not enough proposals. People have not been encouraged in doing research in a big way. So we cannot increase the funds unilaterally.

I was referring to another point which Mr. Naik made. People in the other disciplines are now seriously interested in the problems of education. The interest may be because they are sometimes frustrated in their own disciplines. Some chemists engaged in routine work find that their work is not contributing to national development in any serious manner. Physicists, biologists, mathematicians, etc. are beginning to think that they should at least give a part of their attention to other problems. There is

also an inherent reason why these people are becoming particularly interested in education. I therefore find that now there are a large number of people among scientists and social scientists who are deeply interested in educational problems and if they are made familiar with some of the open questions and areas of investigation, perhaps they would come forward and do research. There is a great deal that can be done. The number of people interested in educational research is increasing. Various other facilities like documentation, computer facilities and scholarships and so on are today much better than before. If all these various inputs are much better then why cannot we concentrate to a large extent on a problem of great significance of educational development today? You know educational development is not a mere continuation of what it was six-eight years ago. Today, the transformation is qualitative. We are trying to bring about qualitative transformation, and I am very glad there are a large number of problems. In the records here I find that the Task Forces have given very serious attention to some of these problems and I look hopefully forward to the two days that you have consented to stay here. You would really be able to compile not only a set of problems, not only problems of priority, etc. but of basic research in education, and also be able to exchange ideas with others and give us a kind of guidance in the matter of developing our work. In calling this particular conference, I had another purpose and from the attendance here, I was expressing my worry to the ERIC Chairman. I hope that it will soon catch up. I cannot help going back to the design of many research conferences which are extremely numerous amongst



scientists. One of their features is that agencies like CSIR, which sponsor a lot of research, hold conferences once a year or two years. They invite all the people who have research projects from the Council. The idea is that each research worker should report on what he is doing by reading a paper. The discussions take place in small groups. There are questions from the audience, specialists in particular areas regarding methodology, objectives, aims, analysis, etc. There are discussions on how improvements can take place. This is an excellent feedback on which young research workers, lecturers and young people are engaged. They become a source of ideas for young people. Two- or three-day conferences of this type have a great value for the young people who attend. We desire that research fellows working in our schemes, participate and benefit from these conferences and go back with many new ideas. There are not very many young faces here. Perhaps we will catch up today or tomorrow or perhaps in the next conference. This conference should not only lead to a discussion of research problems and priorities but might provide an opportunity to meet each other and formally and informally discuss what they are doing and how they are likely to get results.

*November 2, 1976*

CONCLUDING REMARKS BY  
PROF. SHIB K. MITRA, CHAIRMAN, ERIC

We have come to the end of this conference. It is very gratifying for me that in this last session we had 14 speakers and got tremendous variety in the kind of problems which have been placed before

us which reflect and show the state of educational research in India. Realistic estimates can be made on this basis as to what we are capable of doing and what we are really interested in doing. During these two days, there has been one realization on my part. I do not know if you would share it with me. When we talk of educational research for development, we are talking of educational development, and the research tends to drop out of the picture, which suggests to me that we should really broaden our concept of educational research to include what in the more advanced countries is certainly not called research, but development. A lot of work has been reported here, which will be called case-studies and a clinical variety of research. We do not have any control whatsoever—experimental or statistical—but nonetheless the results are produced on the basis of what one has diagnosed properly. One has done something and tried out something. One even would like to generalize almost like a doctor in the medical field treating patients with certain kinds of prescription. Much of our confidence in non-formal education is of this variety and there is no harm in accepting even this as a subject of research. Against one case-study which should be accepted as good enough, I find other sophisticated varieties of research spelt out in the analytical model given in Dr. Gore's paper and also given in the Task Force Paper 4.3.

Therefore, to me it appears that as a result of this conference, there is certainly, to my mind, one significant step forward. It so happened that in 1965, when the Education Commission was in session, I was asked to convene an educational research conference. Between that conference and today's conference there is a significant difference which I

notice: we did not talk about innovations at that time. We did not talk about a single case-study, we did not talk of the clinical approach at all at that time. All that we talked about was about various varieties of historical research, philosophical research, child development, educational psychology, sociology of education and just barely economics of education. Now from that point of view, I think the picture has changed very much in India and perhaps we are falling in line with what is happening elsewhere in the world. There is a growing and increasing concern with the basic problem of education, it is unlike physics, chemistry or psychology. It is a discipline of a different kind where you are challenged again and again to face the reality.

Perhaps this characteristic of education as a discipline creates and makes difficulties for educational research and it is not desirable that all educational problems are researchable problems. Some problems can very well be demanding certain actions leading to certain desirable changes. And sometimes out of sheer allegiance to educational research, we should have some more research and get more information. I think these are the kinds of realizations which I have had and I think many of you would like to share with me. We have covered a very large ground in these two days. We were nowhere near the point that we could say that now we have determined priorities 1-2-3-4, etc. In this respect, we are where we were exactly in 1965. [Prof. Mitra here referred to Dr. Naik's inaugural comments about Dr. Kothari's views regarding the fixing of the priorities in educational research.] We need not lay down priorities. If you know well enough, you know the priorities. The priority that we need to do something

about is to increase our knowledge about intervention strategy, about this whole gamut of education and different aspects of it. Beyond the economic, sociological and other models, more related to the national level planning, we should find out the grass-root educational worker whether in the school or in the college or in the university. We are by and large faced with this problem of quality in the sense that our quality is at the 'O' point. We are trying to blame the poor teacher and everyone is dissatisfied. I think we do not realize that this quality of education is the result of so many different things. In this process we need our direction that has been the upshot of these discussions. We need research in non-formal education, management, organization, innovations, educational development and manpower and so on.

So I think this has been a very fruitful conference with which I am concerned. I am certainly going to report to the ERIC, which meets tomorrow, that this conference has given us this kind of picture in terms of policy. Mr. Naik very categorically made his inaugural remarks, and his remarks are worth while. We have two Working Groups, four Group Reports and three Task Forces Reports, four or five researchable problems which we can do in a collaborative manner in different parts of the country. In addition, we could place ideas of developing units one in each state, four such centres or two sub-centres, which should be supported by the NCERT in terms of fellowships to develop the competence of that centre. It may be one part of the psychology or economics or education. Then certainly the ERIC will be seized of the problems brought before this conference in terms of the research areas. I must thank you all for your excellent cooperation and will-

ing participation in helping us and thinking of the ideas given here. I must also thank Prof R.P. Singh and Dr. C.H.K. Misra and his colleagues and the ERIC Secretariat and other workers who did very hard work to make this conference a great success.

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## Teaching the literary language

Dr. Suresh Kumar of the Central Institute of Hindi, Agra, in a recent article (*Language Forum*, Vol 1 No 3 and 4) examines the relationship between language and literature, and the application of language analysis techniques to the study and teaching of literature. Grouping languages on the two bases of Mother Tongue and Other Tongue, the author assumes that the teaching of literature as a part of teaching language is more relevant to the adult Other Tongue learner. He wonders why at all should the OT learner study literature. "Literature cannot be an all-time 'must' in the inventory of language content to be supplied to the consumer. It depends on his needs, intentions and interests which should correlate with what literature is

"If the OT learner aims at acquiring knowledge of the socio-cultural tenets of the community he may go for the study of literature primarily as a social system. If his aim is to comprehend and acquire productive control over 'elements' of excellence of speech and special style of the other tongue he may view at its literature basically as an artifact.

"I am in favour of register-based teaching of literature which I prefer to call stylistic method of teaching of literature as distinctly different from the intuitively oriented method of literature

teaching more in vogue in MT teaching and generally extended indiscriminately to OT teaching. In my own experience, the OT learners whether unicultural bilinguals or bicultural bilinguals have responded well to the application of this method. Their gradual progress in performance of use of literary language was a reliable index of their acquisition and communicative competence.

"It is more useful and practicable to neutralize distinction between literary and non-literary texts as considered equivalents to imaginative and non-imaginative writing in tradition, especially, in a language teaching course designed for OT learners. In such a course, every "organized" text is a literary text performing aesthetic function. However, the nature of aesthetic function may not be the same in 'imaginative' writing as in the 'non-imaginative' one. It is the 'cohesiveness' of the text which accounts for 'beauty' in it. The approach, validated by empirical evidence, allows a more meaningful and useful application of language analysis techniques to the study of literary texts."

## English pronunciation

THE Central Institute of English and Foreign Languages Regional Centre, Shillong, reported in the September issue of its *Newsletter* that it had organized a 12-day intensive course in spoken English in August, 1976. It consisted of lectures, tutorials, and practice in the language laboratory. Before attending this course, the participants had never used a pronouncing dictionary of English. But at the end of the course, every one of them was familiar with the International Pho-

netic Alphabet. They could not only look up the pronunciation of a word in the dictionary but could also transcribe words of everyday use. The Department of Education, Government of Meghalaya, is going to present a copy of the English Pronouncing Dictionary by Daniel Jones to all the teachers who attended the course.

### 10+2+3 : D.E.O.s role

THE National Staff College of Educational Planners and Administrators, in collaboration with the NCERT and the Ministry of Education, organized in March 1976 All India Conference of District Education Officers to discuss implementation of the new 10+2+3 school pattern. Prime Minister, Indira Gandhi, said in her address, "The new formula of 10+2+3, which has been rather controversial, has been devised to broaden the base of education and to give greater opportunity of choice to the student. Any new step does cause disruption. That is why we have to proceed with some degree of caution. But we should not hesitate to bring in measures which we consider necessary." She said the District Education Officers' task was not entirely administrative. They "must keep contact with the schoolroom, with new developments of education, experiments in India and abroad. To be effective, these officers should be better than the teachers whom they supervise. Otherwise, they cannot have the respect of the teacher."

Prof. Nurul Hasan, Union Education Minister, said in his welcome address, "The District Education Officers have an extremely important part to play in plan-

ning, guiding and supervising the implementation of the new policies. As you know, we are still far from achieving the constitutional directive of ensuring that all children up to the age of 14 years receive free and compulsory elementary education. The shortfall is mainly among girls and children of the Scheduled Castes and Scheduled Tribes. Various factors have contributed to this shortfall in enrolment. This is partly due to the inadequacy of schools or of teachers for which funds could not be provided, partly because of social and economic reasons. No generalization is possible at the all-India level. These factors have to be identified and imaginative solutions found in each case. One of the common reasons, of course, is the economic compulsion which forces a child to participate in productive labour." He further said, "Education has to be looked upon as a lifelong process. It can and should be combined with productive labour. It is, therefore, essential that we develop three aspects of our educational policy with great care.

"Firstly, those who are unable to pursue whole-time education should be provided with non-formal education, which will... enable them to participate in the processes of society...

"Secondly, in the formal stream of education, productivity has to be given the highest importance as a part of the work-experience programme. Rules of administration may have to be changed and attitudes of Government may have to be modified...

"Thirdly, we must remember those who should have received education but for one reason or the other dropped out of the system. I am referring particularly to the age group 15-25. Our educational system must provide

functional literacy to this group. .

"The 10+2+3 pattern which is to be implemented in the whole country is not merely based on adding one year here and taking off another year there. It is a scheme which should be looked upon as an integrated whole, which should not be unnecessarily tampered with under pressures of local vested interests or because there is reluctance to provide and allocate even the minimum funds needed for this change-over."

Prof. D. P. Yadav, Union Deputy Minister for Education, in his inaugural address urged the District Education Officers to ensure that the proposed pattern of the curriculum be implemented without any loss of time. He explained the advantages of the new pattern at length.

Dr. Karan Singh, Union Health Minister, in his valedictory address stressed the importance of the role that teachers can play in developing a new philosophy of health as an integral part of education at all levels. He urged the District Education Officers to help establish a close link between the educational and health care systems as a part of the new curriculum.

compulsory to give them an idea about application of science to day-to-day life.

### *Talented Rural Scholarships*

The education department of Uttar Pradesh has instituted an integrated rural scholarship examination for talented students at the end of Class VIII. After a pilot scheme for Garhwal and Kumaon region for this scholarship, introduced in the year 1974, it has been further extended to the remaining nine educational regions from July, 1976. One institution in each region has to provide residential and special vocational facilities to rural children. A three-day seminar was organized at Allahabad for the Principals and selected teachers from September 24 to 26, 1976.

### *New Social Sciences Curriculum*

Government Training College for Women, Allahabad, has set up a study-group to work out the syllabus for Classes IX and X on social sciences keeping in view the 10-year general education curriculum proposed by the NCERT. This study-group met for four days and worked out preliminary outlines, finalizing its proposal by the end of November this year.

## ASSAM

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### FROM THE FIELD UNITS

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#### ALLAHABAD

#### *Project Work for Science Teachers*

The Government has made it obligatory for all secondary teacher training institutions in U.P. to reserve 50% seats for science teachers. As a part of their training, project work has been made

#### *Public Reaction to Examinations*

Considering the high rate of failure in schools, there have been suggestions that the examination at the end of the secondary stage should be freed from incoherent syllabi, incompetent teaching, badly written textbooks, incompetent paper-setting, inflated marking, unmanageable social studies course and wide variation in evaluation.

*Book Banks*

Meghalaya proposes to set up book-banks in 5 colleges, 51 high schools and 205 middle schools in the State during the current year for the weaker sections of the society. Similar facilities will also be extended to 100 primary schools, free of cost. A sum of Rs. 1 lakh has been set apart for this purpose.

*Merit Awards to Teachers*

Assam has introduced an incentive scheme of cash awards of Rs. 750 and a certificate to teachers of primary and secondary schools. This year, 11 primary and 23 secondary teachers will be getting this award.

## BANGALORE

*Stability Funds for Schools*

The Karnatak Government has decided that before a high school is opened, the management should deposit a stability fund of Rs. 50,000 from 1976-77. Formerly this amount was Rs. 5,000.

*Credit System for Degree Courses*

The Mysore University has decided to introduce a credit system at the undergraduate level. Under this system, students can complete the degree course in lesser time by scoring required graded points.

## DELHI

The Delhi schools are facing certain problems with regard to the +2 courses. These pertain to the heavy syllabi in science and social sciences; lack of model questions on the new pattern, and difficulties in the classification of

students in accordance with the new grading system

## HYDRABAD

*Non-Detention in Classes*

Andhra Pradesh introduced a non-detention policy from 1970-71. Under this scheme, a student is not detained merely for want of the pass marks. If he puts in more than 90% attendance he is promoted, except in Class VII and X where public examinations are held.

*Night Schools*

Andhra Pradesh is launching on a new project on an experimental basis. In two districts of Andhra Pradesh, non-formal educational centres were opened for the age-groups 6-14 and 15-25. A study of the working of these centres showed that many children in the age group 6-14 were attending them because they could not attend the regular schools because of occupational priorities. It was felt that evening schools should be started for these children, giving them formal rather than non-formal education. In one block in each district, a few evening schools will be opened. If the results are encouraging, night schools will be opened throughout the State.

## MAHARASHTRA REGION

## POONA

*Adjustment of Surplus Teachers*

THE transition from the old pattern to the new has created problems in Maharashtra. One such is the problem of surplus teachers. The universities in Maharashtra have reported that only 70 teachers out of the 14,000 employed at

college and junior college levels have been found surplus following implementation of the new school education pattern. The Government has stipulated that teachers rendered partially surplus, who were either confirmed or had completed two years of service in a college, on or before February 7, 1975, should be continued in service. The expenditure on their salary would be held admissible under the grant-in-aid rules.

Teachers absorbed in the junior colleges after being declared fully surplus at the university college level would be considered as being in continuous service. Those rendered fully surplus both at college and junior college levels would also be permitted to continue in service.

Maharashtra will incur an annual expenditure of Rs. 7 lakhs to protect the 70 surplus teachers.

#### *New Three-year Degree Courses*

Upon the introduction of the 10+2+3 pattern, universities in Maharashtra are preparing new three-year degree courses which will be introduced from June, 1977. Committees set up formulate syllabi will take the needs of society into account. Masscommunication, hotel management, nautical engineering, defence studies, criminology, environmental studies etc. may be some of the new subjects introduced. The committees will discuss the need for introducing inter-disciplinary courses, optional papers for students in rural areas and the introduction of job-oriented diploma courses. Off-campus courses are also likely to be incorporated in the new three-year degree programmes. These courses would help in making education more relevant to social needs. The environment sciences curriculum is so planned that a student would be required to spend a portion

of his academic term in the rural areas

#### *Grading Semester System*

Bombay University proposes to introduce a grading system on a seven-point scale in addition to the present numerical marking system for the M. A., M.Sc. and M. Com examinations to be held in 1978. It also proposes to introduce the semester system for the new three-year degree courses.

#### *Cleanliness Campaign in Schools*

The State Institute of Education, Maharashtra, has launched a campaign to improve the standards of cleanliness in the schools. A recent issue of the Institute's journal "Jeevan Shikshan" is devoted entirely to the subject of cleanliness in schools. The material for this issue comprises translations in Marathi from NCERT's booklet on the subject.

#### *Science Teaching Gets its Due*

To improve science teaching in schools, particularly the teaching of NCERT's science syllabus, the Director of Education, Maharashtra, has advised Education Officers to ensure that more time is devoted to teaching of science in Classes V, VI and VII. So far, only three periods a week were provided for science teaching. This has now been raised to six.

#### *New Directions in Non-Formal Education*

An awareness of the role of non-formal education is evident from the elementary and adult education programme drawn up by the Bombay Social Education Committee. The committee calls it a need-based programme to help the working classes in the industrial zone of Greater Bombay. The educational content would be related to the needs and interests of the learners. The committee plans to set up 100 centres

and run them for a year.

Apart from literacy training the programme will cover the following aspects of education :

- 1 Environment education
- 2 Education in social, economic, scientific and technological change
- 3 Training in elementary principles of health and hygiene
- 4 Training in basic skills- reading, writing and arithmetic, followed by continuing education programme
- 5 Programmes for leading children and youth to the mainstream of formal education
- 6 Occupational and formal programmes to prepare the learners for employment.

Sixty 'chawls' in the Delisle Road area in Central Bombay would be covered under the programme, which would cost the Committee Rs. 1,20,000 a year

#### *Population Education—Maharashtra*

Population education has been included in the school and teacher-training syllabi in Maharashtra. At the primary level, the concept has been indirectly introduced in general science, history and civics. In class VIII, the topics taught are : population explosion and its causes, its effects and remedies. For Class IX students, the units come under biology—man and his environment. In the final year of the secondary stage, the subject is covered under geography.

#### GOA REGION

##### *New Job Opportunities*

The Institute of Applied Manpower Research has conducted a survey on the job opportunities in the various sectors

of the economy in the next two years of the fifth Plan, ending 1978-79. Nearly 58,000 new jobs will be created in Goa, according to the findings

Occupation-wise, the break-up will be : professional and technical workers : 3763, administrative, educative and managerial workers : 537, clerical workers : 3571, sales workers : 5212; service workers : 8393; farmers and fishermen : 344; production workers : 35,709, others : 457

The sector-wise break-up : mining and quarrying : 4,157, registered factories : 5,355, unregistered factories and workshops : 2,743; non-establishment hotels and restaurants : 7,396, non-establishments : 417, public sector : 6,549, education : 950, banking : 196; other services establishment : 1,295; non-establishment : 12,695.

The distribution, according to the level of education : illiterates and below-matric, 40,147, matric and higher secondary : 4,428, graduates in arts : 626; science : 156; agriculture : 78; commerce : 213, law : 27, post-graduates in arts : 25; science : 149, agriculture : 21, commerce : 16; law : 1, L.T.I Junior and technical school certificates : 8,256; crafts school certificates : 28; diploma in engineering : 993, degree in engineering : 480; post-graduates unspecified : 505; degree/diploma in medicine : 201; degree/diploma in education : 773, diploma/degree in nursing : 211, others : 660.

The findings indicate that unemployment figures in Goa would come down from 28,900 to 17,400, much below the national level.

Nearly 50% of the new jobs will go to illiterates and non-matriculates. There is likely to be a dearth of technically qualified personnel, especially engineers. The demand would be for about 20,000. To tackle the shortage of qualified engi-



neers, (degree and diploma holders) the report says that candidates holding lower technical qualifications should be considered for jobs. Agricultural personnel are also likely to be in short supply and it has been suggested that agricultural support services, particularly at the village level, may be strengthened.

The report says that most students go in for higher studies to improve their chances of getting a job and to improve their personal status. The report suggests that information regarding job opportunities should be made available to students at the decision-making stage.

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#### *T. V. Training for Teachers*

The Educational Technology Cell of the Government of Maharashtra will conduct training courses to acquaint English and science teachers with the techniques of writing scripts and presenting T. V. lessons. Trained graduate teachers with an aptitude for such work are eligible for these courses. The seventeen-day training course for English teachers commenced on December 15, 1976. For science teachers the course began on January 5, 1977. No fees were charged.

#### *Annual Conference of Maharashtra State Secondary Schools Headmasters Federation*

Nearly 2,000 delegates attended the annual conference of the Maharashtra State Secondary Schools Headmasters Federation, held at Pandharpur on October 17, 18 and 19, 1976.

The major discussions related to the new pattern of education. Among the decisions arrived at were the following :

1. The Classes XI and XII of the new pattern should form a part of the school, as recommended

by the Kothari Commission.

2. Orientation courses for teachers should be conducted so that the quality of teaching might improve and better results follow at the public examinations. The conference questioned the Government's wisdom in penalizing teachers alone for poor examination results at the last S.S.C. Examination.
3. Seventy percent of the seats in professional institutions should be reserved for students passing the Class XII examination to be held in March-April, 1977.

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#### *Research Centre for Mathematics*

A centre for studies and research in pure mathematics was set up in Pune on October 13, 1976, through the initiative of Dr. Shriram Shankar Abhyankar, a professor from Purdue University, U.S.A.

The foundation, named after Bhaskaracharyas, the eminent Indian mathematician of the early 12th century, will admit students from the graduate to post-doctoral levels. It will have 20 professors. The expenses, over and above the initial expenditure, would be Rs. 15 lakhs.

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#### SRINAGAR

In order to help deserving students from backward classes in the State to do better in various examinations, the State Government introduced a special coaching programme. The first intensive coaching programme was organized in Jammu from January 12 to March 1, 1976, which 31 students attended. The results were satisfactory. □

## Book Reviews

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### *The Scottish Council for Research in Education*

48th Annual Report 1975-1976, issued in Sept. 1976, pp. 80

As the title explains, the present small brochure is an introduction to the activities of SCRE (Scottish Council for Research in Education) during the years 1975-1976. For an outsider completely unconnected with SCRE, it furnishes data and food for thought. For instance, "Expenditure on educational research in the UK is a very small element in the education budget. Even with the recent ten-fold increase, it is still only 0.1 per cent of the total expenditure on education..." Compare this with the situation in India, which is no better. Yet instead of complaining, read this: "Fortunately, the value of research is not proportional to the amount spent on it." I wish some of us could say the same in this country too.

It is interesting to read through the report and come across informations, observations, conclusions, etc. like (a) "Even to complete a single project usually requires three years..." (b) "It is essential that we plan ahead in education. For such planning, there must be an adequate level of research support, if decisions are

not to be made on an inadequate basis of evidence." (c) "This whole question of research policy and priorities is a major concern of the Council." These remarks in the report remind us of the state educational research in India too is. We know research consumes time, planning ought always to be based on sufficient supporting evidence and that priorities should never be lost sight of, even if they have been arbitrarily fixed.

The report gives a brief resume of the three ongoing researches—all the three of them are of some value to us: (1) *The Awareness of Opportunity*—a joint SCRE and Scottish Department of Education project. (2) *The Demand for Uptake and Supply of Pre-school Education and Care Facilities*. (3) *The Lothian Region House Visitors* project. The Awareness of Opportunity project is divided into two parts: *Awareness of Further Education* and *Awareness of Opportunity*. Both these projects and their designs have been reported. In India too the NCERT is going to assist/conduct district educational surveys for planning vocational courses and tapping unutilized community resources. To be completed in 1980, the SCRE project has under *Awareness of Opportunity* the following objectives:

- (a) The pupils' own awareness and intentions at various stages of their schooling, as these are revealed in successive interviews;
- (b) The influence of school guidance systems, of the work of career officers and of the wishes and actions of parents;
- (c) The actual structure of educational and employment opportunities in the areas.

The last among these objectives is of some interest to us, for the reasons already given.

These are points for consideration that stand out very clearly, e.g. SCRE has only 34 full-time employees and has committees like Finance Committee, Communication Committee, and has nominees on the Council of Secretary of State for Scotland, Scottish Local Authorities, Directors of Education, College of Education, Universities, Scottish Certificate of Education Examination Board, Institute of Education, Teachers Organisation and the Department of Education. Besides conducting and supporting research, SCRE offers Research Fellowships, awards Medals for distinguished work, disseminates findings of research etc. But the most significant activity of the SCRE to me appears to be the work of the *Research Services Unit* and *Information Services*. For details read pp. 26-27 but briefly, the Research Services performs the following duties :

- (1) Professional advice and consultancy
- (2) Statistical services and data processing
- (3) Collaboration with other bodies in research projects

And the Information Services include

documentation and facilities of experts to deliver special speeches.

It is amazing how such a small organization can perform all these activities. Perhaps NCERT could think of rendering research service to people in this country too, particularly because Ph. D. students could easily be guided to collect very useful data. In fact, even national studies could easily be inexpensively conducted.

R.P. SINGH

### *Teachers of English as a Second Language—*

Their Training and Preparation, Peiren, G. E.  
(Ed.) London, Cambridge University Press,  
1968, £ 35 00 pp. 233

ENGLISH in India was the language of the privileged few. With Macaulay's Minutes (1835) it came to be adopted as a medium of general education and as a medium of communication among the educated classes. In the so-called convent/missionary/public schools, English continues to be the medium of instruction, communication and examination. English is not the mother tongue of most of the students enrolled in these schools, yet for obvious considerations they choose to join them. The way they learn English is quite different from the way English children pick up their tongue. The environmental factor leads one to believe that English in India, or in any other Commonwealth or third world country, is taught and learnt only as a second language. This also goes for immigrants in England. In spite of this, in most of our universities, English remains the medium of instruction and examination. Even though the three language formula relegates English to the position of third language in our schools,

it continues to be an important link language at national and international levels. The number of honours graduates and post-graduates our universities produce with English literature as their subject has been increasing. The need to reorient teaching of English in the non-English-speaking countries has been emphasized by agencies like the British Council. As a result of long-range experimentation, a variety of new methods have been expounded for the teaching of English and its literature, as a second language. A teacher of English today is aware of the graduated structural approach, the situational simulation approach, the controlled vocabulary approach involving the direct method, the diagnostic and remedial approach, the traditional translation and retranslation grammar approach, the phonetic and linguistic approach etc. There are also several techniques for teaching various aspects of English literature, particularly at school level.

The book under review, though not a fresh publication, is useful to those who train teachers of English as a second language. It also helps the teacher to improve his own English. In the chapter 'Literary Elements in Teacher Education', Bruce Pattison raises an important point. "Still the idea persists that the aim of learning a language is to read the best examples of its use. At the base of the educational pyramid the grammar grind continues—has indeed been rejuvenated by a change of name to 'applied linguistics' and the employment of machines in 'laboratories' to drill sentence patterns. At the top of the pyramid is the study of the history of literature—a rather mixed collection of great books to which qualities of style seem to have been a criterion for admission but in which poetry, drama and fiction predominate. Very few get

as far up as that, but what goes on there has some influence at intermediate levels". From the very beginning, the child must 'internalize' the second language. "When a person has to be educated through a second language and to spend most of his professional life with it, he has to become virtually bilingual. Within its own domain the second language has to be as much his own as the first language." Thus while suggesting techniques and approaches for the teaching of language and literature as a composite course at all school levels, the author proposes that the teachers be helped to develop their literary and linguistic insight during their training. A.S. Hornby and J.A. Bright present certain practical suggestions to bridge the gap between the theory and practice of teacher education.

Pre-service training of a year or so does not help much. Hence the need for in-service training at regular intervals. Among the models available in the developing countries, D.A. Smith commends the 'Madras Showball', which provided in-service training to over 30,000 teachers of English during 1959-63. No amount of training—pre-service or in-service—could help a teacher who is not self-motivated and self-directed. Peter Stevens identifies at least four essential strands for the auto-improvement of English teachers which may comprise a progressive programme of (i) guided listening and reading; (ii) writing and listening exercises; (iii) enrichment in present day English; and (iv) remedial work on the teacher's own shortcomings.

The training of teachers of adults has been universally ignored. H.A. Cartledge emphasizes the need of special courses for these teachers while W.R. Lee advocates the creation of activity-oriented study centres.

Still another neglected area, as pointed out by S.P. Corder, is the lack of advanced courses in English as a second language for teacher-educators, inspectors and administrators.

Finally, G.E. Perren, the editor of the book, discusses the problem of teachers of English in countries where it is taught as a second language but used as a teaching medium.

The book puts together the findings of successful projects in Britain and the Commonwealth countries, drawing out guidelines for the teaching of English as a second language. A variety of approaches to the problem is suggested. The contributors write on the basis of their experience, and the information presented should be useful for teacher-educators, organizers and policy-makers in teacher education.

The bibliography lists useful specialist periodicals and books dealing with the pedagogy of English, and a few reference books.

MRS. N. KUNWAR

### *Rajasthan Mein Shikshanusandhan*

(Sampratiyan Evam Sambhavnayen) Ed.  
Indrajeet Khanna and Pannalal Verma,  
Department of Education, Rajasthan, 1976,  
pp 188

About 20 per cent of the M Ed. dissertations in Rajasthan have been submitted by women. From 1953 to 1974, 673 M.Ed. dissertations were approved by the universities in Rajasthan. Only 19 Ph.D's in education were awarded between 1963 and 1974. Twenty-five research projects were sponsored by the State Institute of Education and four by the Rajasthan Board. These facts have been revealed in this publication brought out by the

Education Department, Rajasthan.

The highest number of M.Ed. dissertations were on educational and vocational guidance (about 21%), followed by teacher education (13%), personality (about 12%) and school organization (about 11%). Less than one per cent were on social education. Other areas which have been explored are measurement and evaluation, educational achievement, curriculum and textbooks, the teaching-learning process, educational psychology and sociology, and educational administration. Each of these areas has been covered in one chapter written by one or two experts in the field. There is a very brief resume of the findings of the different researches in the area. This is followed by an outline of the possibilities of further work in the field. At the end is appended a list of all the dissertations and authors referred to in the book.

This publication provides an extensive survey and analyses of educational research in the State and will prove useful for researchers. It will also help the practising teachers, teacher educators and educational administrators by bringing to their notice the research findings in different areas.

ASHOK MATHUR

### *Extending Educational Opportunity in Sikkim*

Veda Prakasha, National Staff College of Educational Planners and Administrators,  
New Delhi, 1976, pp. 106.

EXTENDING educational opportunity to all is a serious issue in the field of education. No country, however socially or economically advanced, has been able to chalk out an ideal plan of action. National and sectional prejudices have hin-

dered the spread of education.

"Extending Educational Opportunity in Sikkim" is a report submitted to Prof. S. Nurul Hasan, Minister of Education and Social Welfare, on July 31, 1975. Sikkim joined the Indian Union as the 22nd State on May 16, 1975. The Education Minister felt that the educational problems of the State should be studied, and as a result this report was prepared by Shri Veda Prakasha.

The book is divided into twelve chapters grouped under two parts. Part I consists of six chapters describing and assessing the present education situation in Sikkim, while Part II is an evaluation of the present system of educational planning and administration in the State. The help that the National Staff College for Educational Planners and Administrators can render to improve education in Sikkim is also discussed.

The State is divided into four districts. Mangan (north), Namchi (south), Gangtok (east) and Gyalzing (west). Lepcha, Sikkimese and Nepali are the languages spoken. The main occupation in Sikkim is agriculture. About 89% of the population is engaged in it.

Literacy in Sikkim is very low. The 1971 census showed a literacy percentage of 17.7%. During 1974-75, Rs. 39.91 lakhs was spent on education. During 1975-76, a provision of Rs. 52.90 lakhs was made for different educational schemes. There are now 226 primary schools (four classes), 31 junior high schools (eight classes) and six higher secondary schools, besides a public school and an evening college, in the State. The number of children enrolled in primary schools, junior high schools and higher secondary schools is 11,667; 3,291 and 683 respectively. About 60 students are studying at the evening college. The participation

rates at the primary, junior high and higher secondary levels are 59.1%, 21.6% and 6.2% respectively, and is lower in the case of girls.

Education in Sikkim in the 19th century was of the monastic type. The first primary school was started by a missionary, Rev. Macfarlane, in 1872-73. The present education system is simple and linear. The child begins his education at the age of five or six and by the time he finishes school he is 16. At the primary stage the subjects taught are languages, general science, mathematics and social studies. From Class III onwards the child is required to study three languages. English is the medium of instruction and one of the compulsory languages. The author suggests that every child should have the right to receive instruction in his mother tongue and early introduction of the second and third languages should be discouraged. Hindi can also be made an alternative medium of education.

Till 1966, the textbooks were prepared by the Oxford University Press, Calcutta, which are now being replaced by those produced by the NCERT.

In Sikkim, education is free for boys up to Class VIII and for girls up to Class X. A Board on Educational Facilities was set up in February, 1975. Education of girls is checked because of lack of girls' schools. A major problem in the spread of education in Sikkim is the distance between school and home. Child labour is common. To control it, the State Government has decided to introduce a modest midday meal programme from this year. The Central Advisory Board of Education has suggested that the present system of single point entry should be modified.

There is no full-time degree college

in the State. There is no technical institution (school level) and the State Government is keen to establish one. The author suggests an institution on the ITI mode.

Most of the teachers employed at primary level are untrained and some unqualified. There is only one teacher-training institution—in Pelling.

The seniormost authority in education in the State is the Education Minister. Next come the Director and Joint Director of Education. The Directorate is divided into the Administrative Wing (consisting of two Assistant Directors of Education and one Accounts Officer) and the Academic Wing (consisting of three Assistant Directors). At the district level one District Education Officer is assisted by an Assistant Education Officer. The author suggests the establishment of a small advisory board of education with the State Education Minister as Chairman and the Director of Education as Member-Secretary.

The matter of pay scales should be looked into carefully. The Department has taken over 38 private primary schools and is thinking of taking over more. The problem of recruitment and training of teachers should be carefully thought over.

School buildings and hostel facilities must be improved.

The reports of school inspectors are

confined to items like enrolment, attendance, school building, furniture, etc. Suitable proformas must be developed and used for this purpose.

Chapter XI deals with the role of the National Staff College, and with Chapter XII (Summary of Recommendations), constitutes the most important part of the report. There are valuable suggestions and they should be put into practice soon.

The author touches upon almost every aspect of education, though he is not always able to supply relevant data. Apart from the current educational problems of Sikkim, the author gives sufficient background information on Sikkim which is helpful in understanding its educational problems. The tables are of great help. By and large it is a sound report based on correct data; it makes valuable recommendations.

An important point which has emerged from this survey is that in Sikkim, decentralization of power is needed and steps to bring it about should be taken immediately.

Since Sikkim would take time to frame its own rules and evolve a plan for developing designs for inexpensive school buildings, or for that matter open institutions of higher learning, it is time that new grounds were broken in all these educational areas. □

NEERJA SHUKLA





# JOURNAL OF INDIAN EDUCATION

Volume II Number 6

March 1977

## CONTENTS

1	EDITORIAL
USHA JOHN 3	The Doorways to Knowledge
T B. MATHUR 7	Functioning of the School Library
K L. LUTHRA 10	Administration and Organization of School Libraries
ANAND P. SRIVASTAVA 17	Some Ways for Better Reading in School Subjects
A.U KHAN 23	Problems of the School Library
S. L. VERMA 27	Reference Service in School Libraries
SYED HUSAIN RAZA NAQVI 31	Importance of the School Library in the New Educational Pattern
34	BRING THEM TOGETHER (Photo Feature)
M. VENKATIAH 39	How to Make Students Library Conscious
42	Training Course for Educational Planners and Administrators (Lecture Discussion)
AGYA JIT SINGH 48	Psychology of Audio-Visual Aids
V.P. JEYARAMAN 51	Exchange of Information on Scholarly Work in Indian Universities
R.C. WADHERA 54	School-Sponsored Social Service
G.S. MUDAMBADITHAYA 58	Need for Teaching Literature in Secondary Schools
62	EDUCATIONAL NEWS
65	BOOK REVIEWS
RAJWANT SINGH 69	Select Bibliography on School Libraries
S.M SIBTAIN 72	An Annotated Bibliography of Books on School Libraries

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## NCERT INFORMATION SERVICE FOR EDUCATIONAL RESEARCH

The Educational Research and Innovations Committee of the NCERT is starting a new service of collecting and disseminating information on educational research done/being done in different research institutions in the country. By educational research we do not just mean the research that is done at the post-graduate and doctoral levels in the education departments of universities and training colleges. We also include any other research in social sciences, humanities, physical and life sciences, etc. which has any bearing on education at school, college, and university. And beyond institutions of formal education--in the field, farm, and factory covered generally by the term 'non-formal education'.

The ERIC Secretariat in the National Council of Educational Research & Training would be glad to receive information about research projects/studies on the proforma given below. Printed copies of the proforma are available with the ERIC Secretariat.

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Initials

**SRI AUROBINDO MARG,  
NEW DELHI 110016**

**This is a Form for Educational Research Information. Please fill in this Form and send back to Dean (Research) at the address given above. The information that you give here will be made available to researchers and users of research. A list of information will be published in the Council's Journals. Attach separate sheets wherever necessary. Use one Form for one project only. You can send several Forms.**

1. Title of research / study / investigation
2. Statement of the problem
3. Research method (s)  
[including techniques and design of experiment, if any]
4. Sampling design, if any
5. Findings  
(tentative for incomplete study)
6. Amount of money (if any) and the source of funds
7. Duration of the project . \_\_\_\_\_Year\_\_\_\_\_Months  
Date started .  
Date ended .  
(nil, if continuing)
8. Whether published  
(a) (give details)  
(b) If not published, whether \_\_\_\_\_Yes\_\_\_\_\_No\_\_\_\_\_  
typed report is available
9. Name and Address of the principal Investigator
10. Signature of the principal Investigator.  
and date

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# Indian Psychology

*A Journal of Classical Ideas and Current Research*

EDITED BY

PROF. K. RAMAKRISHNA RAO, Ph. D., D. Litt

(In cooperation with a board of consulting Editors)

*Indian Psychology* is a journal of ideas as well as of hard facts. It provides a forum where the past and the present meet to create a psychology of the future. This international journal is devoted to the discussion of classical ideas concerning the nature of man and current research aimed at their empirical testing and application. It publishes both theoretical papers and empirical reports. The emphasis, however, is on the integration of research and theory. Cross-cultural and inter-disciplinary research and studies to integrate normal, abnormal and paranormal experiences so as to stimulate alternative scientific paradigms and heuristic models for the study of man will be of special interest. While the primary focus of this new journal is on larger issues having a bearing on man's total nature, investigations dealing with specific variables will also be considered for publication.

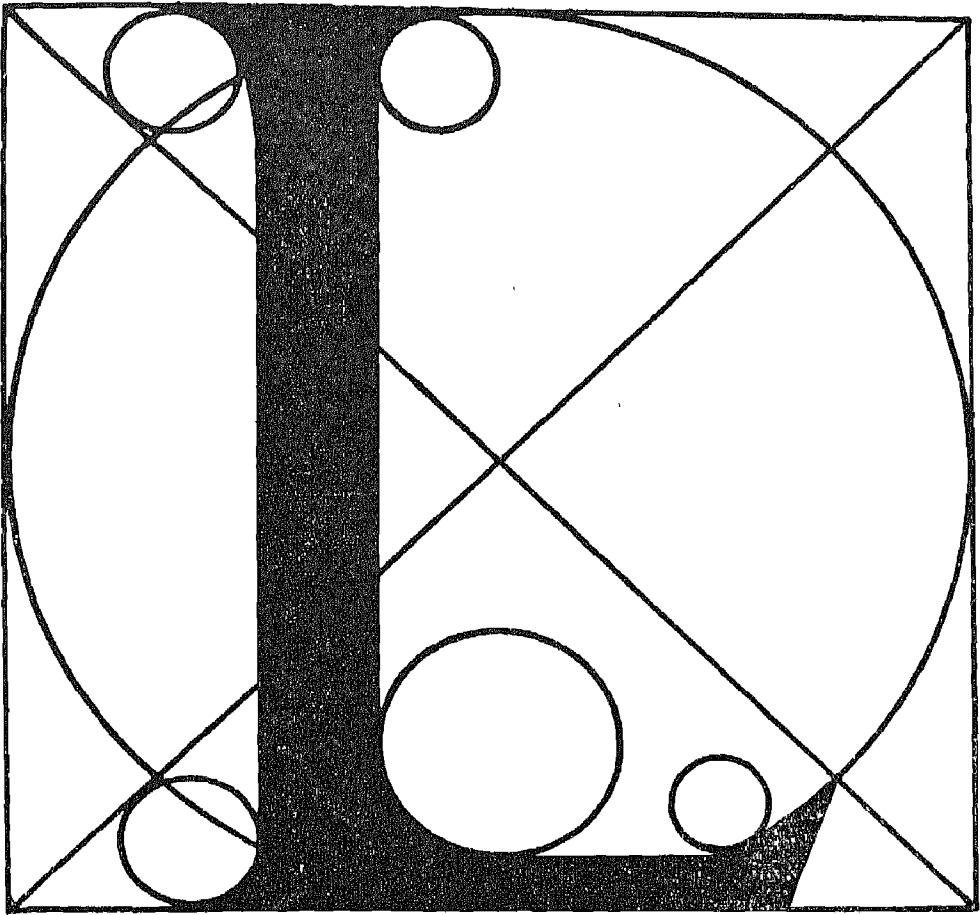
## *Subscription*

*Indian Psychology* is published half-yearly in January and July by Andhra University. The annual subscription rates are as follows :

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ALL SCHOOL LIBRARIES in India are not in good shape. There are some that have no books and there are others where books are seldom issued out. Books are kept in closed almirahs for fear of loss. Teachers assigned library work consider it an additional burden and thus take no interest in it. Children complain about the choice of books because the money allocated for their reading is usurped by teachers for the purchase of textbooks that are used for their own examinations. Dusty, dull books in libraries frighten the children away. Very little research has been done to improve the situation. We keep forgetting that books are meant to be read and circulated. Even at the risk of stating the obvious let us repeat that

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**Editorial**

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book, ought to attract readers and not turn them away. While talking to Mrs. Malathrop, Ruskin had declared: "Madam, a circulating library in a town is an ever-green tree of diabolical knowledge! It blossoms through the year!"

We are attempting through this number to attract the attention of school administrators regarding the importance of school libraries. If libraries are needed for research scholars, they are equally necessary for the children whose interests keep on waxing and waning over a stretch of time. We would do well to remember that India also produced one of the eminent figures in library science—S.R. Ranganathan.

We hope that this special number on school libraries will set some of us re-thinking. Volumes have been written on the usefulness of a library. And before volumes are written on the necessity of school libraries, we should certainly have them in sufficient number.

But then, the number of such libraries, however impressive it becomes in future years, is not going to achieve our objective. A school library should be treated by the administration as an extension of the classroom, providing a much wider view of the world around the children. So far it has been treated as something separate, something optional. So far we have failed to make it complementary to the classroom teaching. And our school staff responsible for the selection of books have not been careful and conscientious, being mostly led by the booksellers and publishers. That is yet another area which needs some re-thinking and informed planning.

A number of institutions have now set up book banks to be used by the needy. But we must not overlook the ever lengthening queues of those who are just joining the ranks of new readers. We should have libraries to welcome them in. □



Empty contours haunt  
the reading room. In these  
shadow-shapes rests  
our hope of having  
such libraries where our teachers  
can teach themselves.  
some day...may be after a  
decade. or two.. Maybe this  
our hope is too high...



It'll take too long, maybe...  
Yet, we do not give up hope...  
They have made it in  
other countries...  
Some day our teachers will  
fill up the empty contours. .  
Some day...  
if we work for it now...



# The Doorways to Knowledge

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USHA JOHN

LIBRARIES have always been regarded as the doorways to knowledge. The world-renowned libraries of Taxila and Nalanda attracted scholars from far and wide. To this day Indians continue to make significant contributions to the advancement of library science.

Dr S. R. Ranganathan, National Professor of library science, published in 1937 his pioneering work on the theory of library classification. He was one of the first to work out the whole mechanics of classification and to probe deep into the structure of what is now known as depth classification. In 1962, Dr Ranganathan established the Documentation Research Training Centre at Bangalore.

Libraries have acquired a special significance in the context of an unprecedented explosion of knowledge. Science and technology have advanced at a spectacular speed. There have been radical changes in the concepts of the liberal arts too. Such vast knowledge and

information can only be disseminated to the public by libraries.

Self-education and continuing education have now become essential as a means of keeping up with the advancement of knowledge. Formal education must be supplemented and followed up by self-education. Here again libraries play a very important role.

As a developing country, India needs more specialized libraries at universities. Scientific institutions must have good libraries as well. Libraries being a source of learning, inspiration and recreation, it is necessary to have qualified and well-paid librarians to ensure their smooth functioning.

The Ministry of Education is fully aware of the importance of good libraries. It has decided that Delhi will have two new research and reference libraries in a few months' time. Temporarily housed in a section of Bhawalpur House, they will be known as the Library of Indian

National Languages and the Central Hindi Library. The Education Ministry has spent about rupees four lakhs on books, equipment and staff for these libraries.

In a recent interview, Mrs. Visalakshi Sundaram, a lecturer in the Department of Library Science, Delhi University, said, "India is fairly advanced in library science. Our Department, set up by Dr. Ranganathan, has had students from the U.A.R., Iran, Afghanistan and Nepal. The Delhi University Library is organized according to the classification scheme formulated by Dr. Ranganathan. More and more women are taking up this course—in 1958 when I joined the library science course, about 30 per cent of the students were women. Now it is nearer 70 per cent. Some women students have topped the list as well."

Paradoxically, there is only one woman who heads a library science department out of over 35 university departments in the country. "She is Dr. Khandwala of the S.J.P.P. College of Library Science in Bombay. More women library science graduates are being employed by libraries all over India. Many libraries are employing our students because our department is known for maintaining high standards," she said.

Visalakshi Sundaram is the only woman lecturer on the teaching staff of eight. "The lecturers of library science," she remarked, "present the subject the way they think they should to the students. The Department has two post-graduate degree courses—Bachelor of Library Science and Master of Library and Information Science. Recently we have introduced a few additional courses. We may also have M. Phil. courses from 1977/78. The Department also enrolls students for Ph. D. programmes. We revise the courses regularly, and in the Master's course, we train students for

specialized libraries by offering them elective courses. The application of computer technology for bibliographic services is one of the latest developments in library science, and courses covering this area are being included in Delhi University's library science curricula." Commenting on the Delhi University Library, Mrs. Sundaram said, "It is used and criticized by all parties concerned—students, teachers, and librarians. Replacement of damaged or lost books is slow. Most students get their basic services from the college libraries. There is a great demand for textbooks two months before the annual exams, and neither the University Library nor the college libraries can cope with the demand fully."

Regarding the supply of books she observed, "Though the University Library enjoys the financial support of the University Grants Commission and the Ford Foundation, the need for economy has brought down the number of books the Library procures from abroad. The price of books has been soaring—Indian books which used to cost Rs 4 now cost Rs 45 while the average foreign publication costs around Rs 120. Purchase of periodicals from abroad has to be channelled through the STC. This prevents speedy procurement. The situation may improve this year, however. There are also other factors which further delay the procurement of books. Books sent by surface mail take three to four months to reach their destinations. Since booksellers and agents are interested in bulk orders, procurement by them also takes time. Such delays lead to dissatisfaction on the part of users who blame the libraries."

Libraries can flourish only when they have adequate funds, efficient and qualified librarians and readers who want to expand their knowledge through books.

"Unfortunately, people in India don't read books with this end in view," Mrs Sundaram pointed out.

"Mobile libraries," she continued, "have a role to play in modern Indian society. But to make this service a success there should be a demand. Mobile libraries have not been well received by the people. Such libraries function well where there are no libraries in the vicinity—where people have more leisure, and where there are people genuinely interested in widening their knowledge."

Librarianship is a profession dealing with the organization of knowledge which would be readily accessible to readers. This involves a wide knowledge of various subjects and knowledge of storage and retrieval techniques, book selection, ordering, classification, cataloguing, reference service, etc. Developments in the field of bibliography such as use of computers, abstracting services, new indexing techniques and specialized schemes of classification have gone a long way in improving library services.

Dr Ranganathan's evaluation of the work of qualified librarians convinced the authorities of the need for establishing parity of this profession with the teaching profession. In 1957, the UGC Library Committee under the Chairmanship of Dr Ranganathan demanded parity for librarians with regard to status and pay scale with the teachers in colleges and universities. In recent years, the Kothari Commission and the Mudaliar Commission have given their reports saying clearly that librarianship should be treated at par with teaching. The Sen Commission, however, to the dissatisfaction of librarians, in its recommendation for revised pay scales for teachers, has ignored librarians.

According to Mrs Sundaram, "The

UGC Committee on University Libraries had recommended parity of this profession with the academicians and this had been accepted by universities in the early 1960s. When the second pay revision took place in 1965, an attempt was made to exclude working librarians without the prescribed minimum qualifications (M.A. II Division and B. Lib Sc. II Division or B.A. II Division with M. Lib Sc. II Division) from the revised scales. But many universities recommended the protection of those already in service from such discrimination, and succeeded in their efforts. Some universities, like Delhi University, went further in giving the librarians academic status by permitting them to avail themselves of study leave, and duty leave for delivering lectures, although they did not get the benefit of vacation. With the third pay revision, the Sen Committee did not put forward recommendations for librarians, since this was outside their frame of reference. This was taken by many to mean that the Committee did not favour librarians' parity with teachers and that it felt they should be equated with administrative staff. A committee has looked into the matter and recommended grades equating librarians with administrative staff. This is rather unfair to librarians as they have qualifications which take time to acquire. Also, their working hours are not as convenient as those of administrative staff. Some universities, Delhi University for one, have recommended to the UGC the continuance of parity of grades for librarians with teachers. In the meantime the university librarians are still drawing the old grades of pay while awaiting a decision. Government librarians have been awarded revisions at par with administrative staff. They have never drawn salaries equivalent to academic librarians.

The librarians of the I.I.T., Delhi, for example, have had their salaries revised on similar lines with an assurance that should the university librarians get academic grades, theirs' would also be revised."

Summing up her views on this issue Mrs Sundaram said, "On the whole the position regarding academic librarians, as of date, is unsatisfactory. It is not

clear what will be done. Why should the principle of parity with teachers be questioned every time a revision of salary takes place? After all they are as qualified as the teachers professionally. And why can't librarians work together for common objectives? And why does it take so long for a decision to come forth? These are questions which occur to all of us, but the answers vary and are difficult to get." □

# Functioning of the School Library: Tested Practices

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THE SCHOOL LIBRARY plays a vital role in the development of the teaching-learning programme of a school. The Extension Services Department of the Regional College of Education, Ajmer, conducted a project for a period of four years. Starting with six schools, the project attracted neighbouring schools and so the number of schools covered increased to 12. The participants of the project were school librarians, teachers-in-charge of school libraries, headmasters, and the staff of the Regional College of Education. The participants discussed ideas, tried them out, observed their functioning and discussed them again. The meetings and visits to school libraries were organized in a systematic manner and evaluation was conducted twice during the four years.

The experience gained by the author through this project is discussed in this paper, along with his suggestions for

a more vital role for school libraries

1. A record of what the students read should be kept in a notebook or register. The record should be checked by one of the teachers once a month. This will motivate the students to read more. The students reading more books and journals may be further encouraged if their names are announced in the school assembly.

2. A new idea that was tried out was the 'Little Children's Library' in an Ajmer school. The L.C.L. of St. Anslem's School was an innovation and the idea is spreading to other schools in Ajmer. Children flock to the L.C.L. of St. Anslem's not only to read books and magazines but also to consult charts and other visual material.

3. In order to improve the circulation of books and magazines, some of the project schools started hand-written magazines. Such magazines, brought out

periodically, provide a stimulus to reading habit.

4. The system of reserve books should be so simple that whenever a student wishes to get a book, he can get it easily. Even when the number of students is large, some such practice should be followed by which a student of any class can borrow books from the library at a fixed time. Senior students may be deputed to assist the librarian in his work by turns. Gradually, the schools should switch over to the open-shelf system. Some schools started the open-shelf system and found that the books lost were not many and by levying a general fine for the stolen books, they could be replaced by new ones.

5. Introduction of a weekly library period helped the schools in improving the children's reading habits. During the library period the teacher goes to the library along with the students and supervises their study. He even selects books for the children. The almirahs of the library are kept unlocked.

6. Another device which has worked very well is the practice of giving short but interesting information about books of interest to the different classes. Three or four teachers of the school take up this responsibility and once or twice a week they tell the students something about the books available in the library. This group of teachers may also write simple reviews of books which may be displayed on the bulletin board of the school library so that the students are encouraged to go on to read them. A few "must" books for each class may also be displayed in the library.

7. Once in two or three months the library committee, along with some students, should organize a book exhibition in the school. All the books available may be displayed on the tables

of the library and each class, by rotation, may be allowed to see the exhibition. It has been found that this practice stimulates the students to read and to get to know the titles of many new books which they would like to read in future. Another device is to train the students to collect information from encyclopaedias, year-books and other reference books. The librarian and two or three teachers of the school can take up this work and they may acquaint the students with the technique of collecting information from reference books. This work can be taken up in Classes IX to XI.

#### *Competitions*

The project with the 12 schools has shown that the organization of different types of competitions helps to increase the number of readers. In the case of social studies or civics a competition can be organized in October or November. Students may be asked to prepare a write-up on all the important proceedings of the Lok Sabha or Rajya Sabha. All the relevant newspapers and journals may be placed in the library. The students may be given two weeks' time to read up on the subject and then they may be asked to write on it in the classroom.

Students may also be asked to write on Indian leaders like Jawahar Lal Nehru, Swami Vivekananda, Aurobindo, etc. They may be given easy access to books on the lives of these men. The time given for preparation should be about a month. Later they may be asked to write a letter to their pen friends giving a brief sketch of one of these great men.

Another competition may be on writing briefly about new experiments reported in various science journals. Credit should be given to students who

choose really significant experiments to write on. Still another competition may be on collecting information about any four items from encyclopaedias, journals or year-books and writing briefly about them. It has been observed that these

competitions actually helped the schools to vitalize their teaching-learning practices

The tested practices can be tried out in schools with the hope that the functioning of school libraries would be improved by following them ☐

# Administration and Organization of School Libraries

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LIBRARIES are considered to be an adjunct to education. Healthy growth in education should go with a corresponding growth in libraries. Therefore, in the context of school education, the importance of school libraries can hardly be overemphasized. School education has two main aspects: (i) The development of the child as an individual; (ii) The development of the child as a member of the community. On one hand we seek to make possible the growth of a complete and balanced personality with intellectual, physical and spiritual powers developed to their fullest capacity; on the other hand, we seek to lay the foundations of social behaviour. When the child starts attending school, he needs a store of books to enrich his growing consciousness of the world around him. Books are a source of inspiration and information, particularly for children whose minds are in an impressionable

state. Therefore, if our younger generation is to grow into healthy and disciplined citizens, the development of school libraries cannot be neglected.

The complementary and supplementary role of school libraries is freely acknowledged. However, the best results can be achieved only if our school libraries are properly organized to play their role.

Though the importance of school libraries is universally recognized, the library is often the most neglected part of a school. Barring a few schools in metropolitan cities, in most of the schools, either no library exists or a dark and dingy corner is set apart for the library. Even in metropolitan cities like Delhi, Bombay and Madras, the organization of school libraries is far from satisfactory. All the same, the position is not as bad as it was at the time of Independence, and with every successive



Five-Year Plan, there has been perceptible improvement in the situation. However, improvement in the state of libraries has not been uniform and consistent.

### *Library Building*

In designing a school building, special attention should be paid to the library. The library should be accessible from all the sections of the school and should allow for future expansion. It should be located away from the music room, cafeteria, administrative office, etc. The library design should take into account the need for storage, display and distribution of a wide variety of books and teaching material. It should be such that study and recreation, teaching and discussion can be carried on in the library.

The library should be visualized as a complex and not as a single space. Three major spatial requirements arise directly out of library activities—main library space, teaching and discussion space and space for utility services.

The Secondary Education Commission recommended 30 as the optimum and 40 as the maximum number of pupils in one class. The Commission further recommended a provision of 10 sq. ft. for every pupil in the classroom. However, due to constraints of resources, most schools are over-crowded and the number of students per class is far more than recommended. Therefore, it would be necessary to provide reading space for at least 50-60 students in a school library. Regarding fittings, furniture and building design, it is desirable to conform to the standards laid down by the Indian Standards Institution (BDC/27).

### *Staff*

The library should be properly staffed if it is to play the role expected of it.

Often, school libraries are run by teachers on part-time basis. In such an arrangement, the library gets scant attention. Moreover, there is no incentive for teacher to attend to library work and therefore a general attitude of indifference is noticed. It is, therefore, imperative to have professionally trained persons to run school libraries on efficient lines. The factors involved in determining the size of library staff are :

- i) The number of children and teachers to be served,
- ii) The services required by the learning programme;
- iii) The total number of hours the library is kept open,
- iv) The quantity and variety of material handled, the availability of centralized services such as central classification and cataloguing.

However, it is felt that for a school of 560 pupils with two divisions for each of its seven classes, the minimum full time library staff to work in single shift should be :

- i) One graduate librarian with B. Lib. Sc. degree or Post-Graduate Diploma in library science;
- ii) One semi-professional;
- iii) One unskilled person.

The status and salary of a librarian should be the same as that of a T.G.T. This is very important as otherwise the librarian will not be able to play the role expected of him effectively. Unfortunately, salary is equated with social status, which in turn determines a person's respectability. However, it is realized that due to financial constraints it may not be possible for every school to appoint a full time qualified librarian at present. We may thus have to be content with part

time teacher-librarians for some time to come.

### *NCERT and School Libraries*

Education is a State subject. But the Swaran Singh Committee has recommended that education be placed in the Concurrent List instead of the State List. This would mean that the Centre will not only have to lay down necessary guidelines of mandatory nature for all States to follow uniformly, but also shell out considerable sums of money for development of School Education in the entire country. In such a situation, national bodies like the NCERT, National Book Trust, and Children's Book Trust will assume additional responsibilities. As already pointed out, growth in education is interlinked with a corresponding growth in libraries at all levels, particularly at the school level where the foundations of reading habits are laid.

The NCERT may be well advised to take upon itself the job of reorientation of school librarians and teacher-librarians. This is very essential, especially because most of the school libraries are run by school-teachers not trained to run libraries. The job may be attempted in this manner:

- i) The NCERT may draw up a detailed plan for giving incentives to States to develop school libraries. This is calculated not only to provide financial assistance to States but also instil among them a healthy sense of competition to develop school libraries.
- ii) The NCERT may also organize workshops and seminars from time to time for orientation of school librarians. The existing Library & Documentation Unit in NCERT can be groomed to

take up this additional responsibility.

### *Book Selection and Organization*

Book selection is one of the most important functions of library. Effective book selection demands total involvement and coordination between all the persons at various levels.

- i) At the district level, there should be a qualified and experienced Library Development Officer. He should be given the charge of development and coordination of school libraries
- ii) At the school level, a Library Committee under the chairmanship of the Principal should be constituted. The librarian should be Member-Secretary of the Committee.
- iii) The textbooks and other books intended for wide circulation among all students should be acquired by a central agency, classified, catalogued and distributed among various schools in the district. This will ensure economy in library manpower without loss of efficiency.
- iv) Except for reference books, all other books should form part of a pool and be circulated among the libraries in the district.
- v) A union catalogue of books in the pool should be maintained at the district level. This would necessitate mechanical duplication of catalogue cards for distribution among libraries in the pool. For this purpose, unit card for cataloguing may be followed.

The following points may form the basis for selection of books for school libraries:

- i) *Type size. It should not be too small*
- ii) *Margin*
- iii) *Colour and Paper*
- iv) *Format*
- v) *Vocabulary to suit different age-groups*
- vi) *Length of sentences*
- vii) *Proportion of illustrations to the text*
- viii) *Provision of index*
- ix) *Form of exposition employed—such as story form, dramatic form and narrative form*
- x) *Standard of exposition to suit different age-levels*
- xi) *The length of the book in terms of the number of words used*

The reference collection of a school library should include good children's encyclopaedias such as the World Book Encyclopaedia, the Oxford Junior Encyclopaedia, Arthur Mee's Children's Encyclopaedia, etc. Encyclopaedias in regional languages, dictionaries, atlases and local directories should also be there in the reference section

### *Funds*

Plans of library development are often kept in abeyance if not completely given up on account of 'paucity of resources'. Really it is not lack of funds but lack of determination and initiative that checks the progress of these plans. The library always gets low priority programme—lack of funds is really an excuse. The role of library is to promote reading habits. This may not have a direct bearing on classroom education as the pattern of education stands today, but certainly in the long run, it helps in producing a better student. His general knowledge is wider and his classroom participation more effective. His reading habits culti-

vated his youthful energies—constructively channelized. With formal education coming to an end, the reading habits once acquired are sustained throughout life. Investment in libraries is, therefore, more than justified. It will perhaps be desirable to allocate funds at the rate of Rs. 10/- per student per annum. It may be pointed out that this allocation should be only for the book budget, exclusive of library staff salary.

### *Collection*

The library is a growing organism. The growth of the collection should be carefully planned with an optimum figure of about 10,000 volumes. This would envisage regular and systematic weeding out of worn-out, out-of-date and redundant material. Due to the poor quality of paper used and rough handling, the wear and tear of books is likely to be sizeable. The library should also be used as a Book Bank and a set of textbooks should be loaned out for a year to poor students. Despite some hazards, the open access system should be followed. It is often pointed out that there is a dearth of juvenile literature. This is undoubtedly so and it is a serious handicap in building up a juvenile collection in a school library. Paradoxically, a large number of juvenile titles are lying unsold in the godowns of the National Book Trust. This phenomenon was explained by Prof. D. P. Yadav in parliament. He maintained that this was largely due to a lack of financial resources. This may be so, but the lack of bibliographical control and the scant interest of the book trade in children's literature are also responsible for this state of affairs.

### *Loss of Books*

In an open access library, marginal

losses are bound to be there. Educational administrators should take this irritant in library administration in their stride. With vigilance and careful planning, the losses can be minimized, but cannot be completely eliminated. The UGC Library Committee, under the chairmanship of Dr S R. Ranganathan, had recommended that the loss of two books for every 1000 books issued during the year should be considered reasonable and written off. The question was also considered at length by the All Indian Library Conference held in Tirupati. The conference also recommended that four books lost for every 1000 consulted in the library during the year, should be considered a reasonable loss. Generally, no record is kept of books consulted in the library and it is, therefore, not possible to ascertain the responsibility of losses on this basis. These standards are largely applicable to university, college and research libraries. The position of school libraries is somewhat peculiar, since a librarian or a teacher-in-charge of the library alone is there to run a library. Moreover, the clientele of the school library consists of adolescents who are more susceptible to the temptation of cornering a beautiful book just for the heck of it. Therefore, the margin of losses for school libraries should be wider so that which are inevitable losses do not impede library development.

### *Reading Habits*

One of the most important objects and functions of the school library is to cultivate reading habits among students. The habit of purposeful reading will not come of its own accord. It has to be cultivated and fostered in the early days of school life. One of the essential things a school must do for its pupils is to in-

duce in them a zest for reading, thinking, and arriving at considered conclusions on situations facing them.

To achieve this, there should be close coordination between classroom teaching and use of library resources. The following steps are suggested.

1. Essay and debate competitions may be organized and prizes awarded to the best participants. The subjects chosen for such competitions should require gathering of information from books. Three months' time may be given for submission of the essay. The student should be required to append a bibliography of books and periodicals consulted. Similarly, debate topics should require extensive use of library books. The essay and debate competitions may be confined to Classes IX, X, XI and XII.
2. A library period may be introduced for students from Class V onwards. During this period of supervised reading, students should be encouraged to read books of their interests and records of books read should be maintained individually.
3. New books in the library may be effectively displayed on the bulletin board from time to time. Cuttings from magazines, newspapers, etc. should also be displayed.
4. Exhibitions of useful material may be organized to catch the eyes of students and teachers.
5. A kit of reading material for each class may be prepared. In each kit, 50-60 interesting books on different subjects, suitable for a

particular, class should be put. The kit should be kept in the classroom almirah. The class teacher should seek the help of the class monitor to issue the books to students. The system helps encourage the students to read more books. The books in the kit should be regularly changed.

- 6 It may also be desirable to institute an award for the best readers of the year on the basis of certain criteria—the number of books read during the year, the prizes won in debate and essay competitions, speed in reading comprehension, etc.
7. In order to ensure that students read the library books, library diaries may be issued to the students. The diary should carry the following information:
  - a) Serial number of the books read
  - b) Author and title of the books
  - c) Date of issue
  - d) Date of return
  - e) New words, phrases, proverbs, information, etc. collected from the book.
  - f) Views of the pupil about the suitability of the book for his grade.
  - g) How the pupil is going to utilize the knowledge gained by reading the book in writing assignments, preparing for debates, writing essays, etc
  - h) Remarks of the class teacher. The class-teacher should be responsible for regularly checking the library diaries once a month. On the basis of the diaries, marks or grades should be awarded in the final evaluation of the

students' performance

8. Home examinations and periodical tests should not only be based on textbooks but also on library books. For this purpose, the teacher should announce the titles of the books in the library from which questions could be asked.

The teacher has to play the pivotal role in inculcating reading habits. In order to play this role, the teacher himself should be library-minded and thoroughly conversant with routine library work. It would, therefore, be in the fitness of things to provide for a compulsory paper in library science at the undergraduate and post-graduate levels in the teacher-training colleges.

Further, a national bibliography for English and all the regional languages should be brought out, which should be exclusively devoted to children's literature. This will considerably help in the selection of material.

#### *National Survey*

It is unfortunate that no survey of school libraries at the national level has been conducted so far. Without properly diagnosing the malady, it is difficult to prescribe the remedy. Complete data on the state of school libraries should be made available. National bodies like the Indian Library Association or the NCERT should take up this task.

#### *10+2—New Pattern of Education*

The new curriculum of 10+2 has been introduced at school level. The new pattern of education has been implemented, or accepted for implementation, by most of the States and union territories. The introduction of the new curri-

culum with its emphasis on vocationalization and extension of schooling by one year, will make further demands on library services. Under the new pattern, only the talented students will be allowed to go beyond Class X. Naturally, this qualitative change introduced at the secondary level will require changes in the extent and quality of library services. Unless library services are adequately augmented both qualitatively and quantitatively, the new pattern will not be a success. In book selection, vocational

literature will have to be given due importance.

The development of school libraries is beset with innumerable problems. However, the importance of school libraries has attracted the attention of educationists. With the proposed inclusion of education in the Concurrent List, a qualitative change in school education is inevitable. We may hope that the development of school libraries will be given due recognition and attention.

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# Some Ways for Better Reading in School Subjects

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THE ACTIVITY OF READING—the first step in the process of learning—is common to all the subjects that are taught in schools and colleges. Some facets of this activity are common to any subject. At the same time, there are certain aspects unique to each individual subject. Teachers should see that these features are grasped by their students. A proper understanding of these peculiarities will help students in their study. Here an attempt has been made to suggest some ways for improving the reading ability of students in their mother tongue, English, social studies, science subjects and mathematics.

## *1. Reading in the mother tongue*

In our country there are about a dozen and a half languages. The mother tongue of a student in Bengal is different from that of a student in Andhra or

Madras. But the features and problems of reading are more or less common to all the languages used as the mother tongue. Reading in one's mother tongue differs from reading in other languages because of the enormous advantages a student possesses in case of the former. Since a student can converse freely in his mother tongue, the task of reading becomes quite easy. Reading in one's mother tongue, therefore, should be channelized to achieve the following ends:

- i) enriching life
- ii) developing insights into experience and ideas
- iii) developing literary appreciation
- iv) developing independent reading ability
- v) improving skills to understand authors.

These objectives can be achieved by

the exercise of precaution and judgment on the part of teachers and librarians in selecting reading material for students. The books assigned to students should improve their literary appreciation. The needs and interests of students should be given due importance. Newspapers and magazines must be given to students so that they become familiar with narrative material. Teachers should introduce students to the reading of various forms of literature (poetry, prose, drama, short stories, etc) and point out their peculiarities. For a proper reading of poetry, the teachers must inform the students that:

- i) Most poems have to be read aloud;
  - ii) A poem is compactly written and each word has to be read to grasp the main idea;
  - iii) Words in poetry are often implied;
  - iv) Poetry contains figurative language;
  - v) Symbols are often used in poetry;
  - vi) Complicated allusions are made;
  - vii) Inverted word order is generally used.
- These features of poetry demand a slow, intensive, and concentrated reading. Some poetry appeals to the emotions and some to the intellect. Narrative poetry is easier to read than other kinds of poetry.

Similarly, short stories and novels have their own peculiarities and an understanding of these features by students is essential. Sometimes plots are important and sometimes the characters dominate. Students should be given sufficient training to follow the development of the plot.

If students are oriented in the structural aspects of poetry, fiction, non-fiction,

etc., their reading abilities in their mother tongue are bound to improve.

## 2. Reading in English

The features and problems of reading in a foreign language are, in general, identical to those observed in one's mother tongue. In our country, the English language has a peculiar position. It is neither a native language nor altogether a foreign language. In schools all over the country, English is taught in addition to the native language. The practice of teaching a foreign language in schools is common to many countries of the world. Therefore, English as a second language is not an additional burden on our students.

Teachers of English in our country must emphasize the need of a direct association between words and their meanings, the understanding of structural and phonetic features, and the building up of a sound vocabulary. It is essential for teachers to provide satisfying explanations, create appropriate situations, and give group-practice in conversation. Specialists in the teaching of foreign languages suggest that a student should be sufficiently exposed to the new language. One of the useful techniques of learning a foreign language is the multi-sensory approach, wherein students simultaneously speak aloud, see and write. In the teaching of English to our school students, we must introduce work-books for different grades. Graded general reading material should be given to students for supervised reading in a class. Word games should be taught and it should be seen that sufficient conversation practice is given.

Reading of Social Studies and Modern findings on the teaching of social studies reveal that verbal intelli-



gence is closely related to reading ability in social studies, and also that literal and critical reading are relatively independent abilities. Teachers of social studies feel that a good student possesses a broad specialized vocabulary, has an accurate understanding of space and time, develops metaphorical language and an average intelligence, holds liberal views and takes active interest in community affairs.

Since the topics covered by social studies are generally beyond the students' experience, it is essential that the books suggested for reading should possess the following features:

- i) Sufficient illustrations, maps, pictures and diagrams;
- ii) Ideas should be present in a logical sequence;
- iii) The books should have a minimum of new words;
- iv) They should be well within the reader's comprehension;
- v) The chapter headings, section headings, and marginal headings should be clear and unambiguous.

Teachers of social studies should use certain useful teaching methods. Some of the following methods could be used:

- i) The introductory material should be more or less familiar to the students;
- ii) Experiences common to young students should be used as examples;
- iii) Familiar words should be used to explain unfamiliar concepts;
- iv) Use should be made of specific words, as much as possible;
- v) Details should be explained to clarify main ideas.

The major subjects covered by social studies are: history, geography and cur-

rent events. While reading history the students should be taught to think on the following lines:

- i) What led to a particular situation?
- ii) What problem does a situation present?
- iii) What may happen next?
- iv) What will be the consequences of a particular situation?
- v) Whatever had happened, was it right or wrong?
- vi) What questions does a set of facts answer?

While reading geography one must constantly use pictures, charts and graphs. A comparison should also be made between different lands and peoples and their environments, physical and social. A good knowledge of maps is essential.

For the study of current events, newspapers and magazines are important material. Students should be given practice in interpreting modern events in the light of historical perspectives. Teachers should read out in the class news items and articles, generally of a controversial nature and then ask students to discuss it. Teachers should ask students to read in the class short but important news items. This is likely to interest students in social studies class. The bulletin board should also be used, and students be asked to display their clippings on it.

The school librarian could be of help in providing suitable reading material. The teacher should not extend his knowledge. He should explain to his students the related facts, help them to get a preview of the concepts they are likely to encounter.

Unless suitable guidance is given before an assignment, students will gather only a few scattered ideas and facts, which will be of no use. Division of a class into groups and sub-groups for reading purposes is a common method adopted in the teaching of social studies. A careful explanation of important concepts like the constitution, democracy, etc. is quite essential. These days, many good general books are available in different languages which could be used for instruction in social studies apart from the textbooks.

#### 4. *Reading of Science Subjects*

The textbooks of science demand a variety of skills on the part of a reader. Hence reading of science material differs in many ways from the reading of either literature or social studies. The reading in science subjects, too, have their own peculiarities. A major problem in the reading of science is difficulty with terminology, symbols and abbreviations. Most of the science subjects borrow some mathematical terms as well. Many science teachers feel that in a number of cases unfamiliar term could have been avoided and a common term used. For example, the term 'meteorologist' could be avoided and 'weatherman' used. The second difficulty of our students about terms is that they do not have any occasion to use them. The next idiosyncrasy of science terms is that the words, used in common speech, have an altogether different meaning, for example, the word 'force'. In order to meet this difficulty, the teachers should give special attention to terms and their complete understanding by students. Since most of the terms are frequently repeated in science texts, it is essential that they are understood. The teachers should compile a list of such terms and explain them with the help of a chart. New terms and

concepts should be introduced very carefully. From time to time, tests should be conducted to find out the students' understanding of terms, and if need be, definitions should be repeated. Many enthusiastic teachers have organized science clubs for their students to improve their understanding through discussions, displays and film shows. Students in schools must be taught how to consult a reference book in science. They should be asked to compile a glossary of science words they know. Reading of science texts is more meaningful if the student has the opportunity to conduct experiments. Study of science demands interpretation rather than memorization. A science text is with its mathematical formulae, definitions and laws, different from texts of social studies and literature. The descriptions of steps or procedures of experiments require careful reading by students. Students are required to interpret the texts to arrive at their own conclusions, generalizations and inferences. An advantage in the study of science, as compared to certain other subjects, is the availability of diagrams, charts and pictures.

While reading science books, students must acquire the habit of asking the following questions:

- i) Why should the theory be stated in this way and not otherwise?
- ii) Where are the limitations and exceptions, if any, of its application? What will the various implications of this theory be in different situation?

Such questions should be explained to students by teachers with the help of suitable examples.

#### *Reading of Mathematics*

Study of mathematics is difficult even for good students. A factor contribu-

ting to this difficulty is the nature of mathematical terms. This difficulty remains, no matter what the language of instruction. A proper understanding of the language of mathematics itself is called for.

An analysis of mathematical terms, in any language, would indicate the following major difficulties.

- a) Various terms are used to indicate a particular operation and some for just one operation.
- b) Many technical terms used in mathematics have altogether a different meaning in our common speech
- c) Many technical terms are abstract and hence difficult to grasp easily.

Teachers of mathematics have made certain investigations in this area and compiled a list of such terms. Some of these are :

Area, average, centre, circle, depth, difference, distance, per cent, proportion, quantity, scale, single, square, straight, time, total, vertical, weight, whole, and width, etc. Equivalents of these terms in any language are troublesome to students. Therefore, a teacher of mathematics should take steps to make his students clearly understand these concepts, whatever the language of instruction.

Without a clear understanding of mathematical terms a student can never go far in the field. Teachers should try to find out the terms that are bothering the students and explain them properly. The teachers should work out a phased programme for introducing these terms throughout the year. Students should also be made aware of synonymous (interchangeable) words for concepts and processes. As far as possible the teachers should make their students identify these

terms in a variety of situations. Experience suggests that most students fail to understand properly the true concept of formulae.

A sufficient number of exercises should be done in the class immediately after a formula has been introduced. Students should be encouraged to use various technical terms in their writing and conversation.

While studying mathematics, students should develop the habit of noting down details, analyzing and drawing inferences from these. Unlike literature and social studies, the context does not yield the meaning in mathematics. A calculation in algebra and arithmetic and figures in geometry make the concept clear. An attempt to put things down in one's own words helps a student to understand well what has been read in mathematics. Understanding of mathematics demands repeated reading. Some teachers feel that in certain areas of mathematics the second reading helps in finding out pertinent words, the third reading generally reveals the relations between them and the fourth reading helps in interpretation. In geometry, however, experts feel that the second reading reveals the details of a figure, the third reading enables one to make a symbolic statement; and the fourth helps in interpretation.

While reading a mathematical text, students should constantly remain alert by asking themselves questions like-

What are the facts mentioned ? What questions could they answer ? Which method should be used to solve it ? What are the steps in that method ?

If mathematics is studied in this manner, the degree of comprehension will be higher. Students should be told to build up a mathematical vocabulary by writing down in their notebooks the new

terms that they come across

At present no attention is being given to reading problems by teachers and educational administrators of our schools. Each subject has its own peculiarities and these should be given sufficient attention by all the subject teachers. They should endeavour to launch

investigations into the reading problems

of students in a subject and should publish their findings in educational journals.

An awareness on the part of teachers about the reading difficulties of students and their efforts to improve instruction will go a long way in inculcating a reading habit in our students. □

# Problems of the School Library

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THE LIBRARY is a social institution charged with the work of providing education, information, recreation and inspiration through reading and audio-visual material. A modern library has three active essential constituents, the reader, reading or audio-visual material, and the librarian. The librarian is the link between the reader and the book he wishes to consult. The librarian performs this job methodically and scientifically.

The librarian's work involves great responsibility towards his readers. He follows certain laws of library science. As they are not physical laws, problems always crop up. Here we shall limit our discussion to the school library.

The librarian, in spite of his professional training and qualifications, has to face many problems in the routine working of a school library. Since there is usually no provision for a library in the building plan, there are therefore no cubicles for

study. The library continues to grow, but the growth in material, readers and staff cannot be accommodated. Both library and reading room function in one room where 50 to 100 students sit together. There are not enough furniture, so many students have to remain standing. Often teachers ask the students to sit in the library during their off periods. Thus, maintaining decorum and discipline becomes very difficult. Interior decoration is quite often neglected. This adversely affects the popularity of the school library.

A library is an aid to education and not an end in itself. To achieve the aim of education—cultivation of young mental faculties—the librarian inculcates reading habits in the young readers. The library supplements and augments the class lessons, and helps in developing good interests through its resources.

Librarians have been provided in secondary school only, while primary and middle

schools are without trained librarians. There are even quite a few secondary schools that have yet to appoint trained librarians. A library in a primary school is a must. Libraries in India, whether institutional or public, are in worse shape than in the West. Hence the profession suffers from handicaps and those in it will have to overcome the difficulties themselves.

No matter how large the stock of books and periodicals in a school library, there is only one librarian to run it. Consequently, the librarian has to perform all his duties—single-handed—classification, cataloguing, book selection, book order, arranging the periodicals, accessioning, handling the entrance and exit, correspondence and speaking about maintenance to the authorities.

The book selection committee of a school library consists of senior members of the teaching staff, including the librarian and the head of the institution. This committee seldom carries out its responsible task. It passes on its responsibilities to the librarian. These committees really exist on paper and files. Thus, irrelevant material accumulates in the library and a haphazard collection results.

A very important job in a school library is that of acquiring relevant material and maintaining an up-to-date collection to keep the readers abreast of the latest advances in various fields. Book selection takes place at the end of the financial year on getting a government grant. The librarian expects cooperation from different categories of readers, including teachers, for their suggestions and demands. But the departmental lists have limited book selection, infringed on the rights of readers and interfered with their choice.

Moreover, standard guides to book selection, such as BNB (London) *Books*

*in Print* (New York), *Impex Reference, Catalogue of Indian Books* (New Delhi), *Indian Scientific and Technical Publications* (New Delhi), *National Bibliography of Indian Literature* (New Delhi), *Indian Books in Print* (New Delhi), and Central and State Government lists of publications, etc. are not available in a school library. A school library mostly makes its selection from publishers' lists and catalogues supplied by salesmen. Reading room funds are usually at the Head's discretion, who does not always solicit the advice of his colleagues on book selection. The selection is thus arbitrary. The interests and tastes of adolescent readers and their needs are known to the librarian alone. And yet, his advice goes unsought. The purpose of a library committee is to abolish arbitrary choice and to add relevant and useful literature to the library.

Book shelving also presents certain problems. The rear and the front rows always need regular attention of the trained librarian, who must arrange and readjust them according to the scheme once they get mixed up. The wooden doors of almirahs are a barrier between the readers and the books. However, there is no alternative to the closed access system.

A library should have a collection of books useful to its readers, who should utilize the collection fully. But school periods are not like those of colleges and universities. It is only during the library period that a student can make any use of the library and its services. And the library period does not exist in many schools, although there are periods for all the subjects taught. So students come to borrow books in the short lunch interval of 30 to 45 minutes. It is impossible for a librarian to receive back and lend books to a large number of students during the lunch interval, no matter what the system

adopted at the counter. What is more, a student, at lunch-time, must also take his lunch. The practice is inconvenient both for readers and the librarian. It is impracticable to keep the library open before or after school hours. Many students come and go by school buses. Principals object to their borrowing in between classes and charge the librarian with encouraging indiscipline. As if lending books to students constitutes an act of indiscipline. There must, therefore, be a regular library period at least once a week. Readers have every right to borrow books from the library.

Another problem a librarian faces is the lack of reference material such as year-books and annuals. Facts and figures keep changing all the time, and it is essential for a school library to acquire reference works.

Library and reading-room fees are charged from the students under one head—'pupils fund'. There is no indication as to how much of this fund is to be spent on the library per student. There must be a separate head for library and reading fees, so that the library can claim and use its share. As it is, things are rather vague. The grant from the government is also meagre. There should be some basis for government assistance. A certain percentage of expenditure on purchase of books, periodicals, reference works, furniture, etc. may be given to the library. This grant should be made available at the beginning of the session instead of in February or March.

Stock verification or stock-taking of the library is essential to keep it functioning vigorously. Physical stock-taking indicates the popularity of a library and the efficiency of its staff. It shows if certain books are not used at all, and what books the readers read most. What is essential and retainable, and what is replaceable

and unwanted, out-of-date, unserviceable—it all comes out in the stock-taking. The head of the institution appoints teachers for physical stock-taking of the library. They, in turn, issue a clearance certificate mechanically. Thus, the purpose of stock verification is lost. For fear of loss reimbursement, the librarian too remains unenthusiastic.

Loss of books, as wear and tear, is inevitable in a functioning library. In spite of constant vigilance and the closed access system some of the students take away library material. To hold the librarian responsible for loss, and ask him to reimburse is tantamount to penalizing him. Thus, he is obliged to adopt the closed access system, but to adopt this system for fear of loss is like a negation of the very idea of a library in a school. In spite of the recommendation of the Advisory Committee for Libraries (1959), the librarian still has to make good the loss. The Committee recommended that negligible losses be written off. But this recommendation was bypassed and the librarian continues to be victimized. This Advisory Committee observed. "In many places the (librarian) is even held responsible for paying the cost of books lost during the time he was in charge of the library. We have no hesitation in saying that such practices are iniquitous and unheard of in the library practice of any advanced country in the world. In the first place, the safety of library books depends upon the moral tone of its users and no librarian, unless he is to restrict severely the use of books, can prevent the depredations of antisocial elements. Secondly, since no librarian is adequately paid, the effect of asking him to pay for the loss of books would be that he will place all the books in his charge under lock and key and thus nullify the fundamentals of a good pub-

lic library. We, therefore, strongly recommend that the practice mentioned here should be put an end to and no State government should require a librarian to furnish security or to pay for the loss of books, unless gross negligence or dishonesty is proved against him "

Holding meetings, examinations and classes in the library interferes with its normal working and disturbs readers who spend their leisure hours in reading. Current library literature keeps the librarian abreast of the modern trends in library management, in the absence of which library performance tends to decline.

There is no directorate for school libraries, like the Directorate of Physical Education, staffed with qualified and ex-

perienced personnel who can guide and advise the nascent school libraries.

The school librarian has not attained the position that others of similar qualifications command in an institution and society. Even the teaching staff regard him as a storekeeper and the library as a dangerous diversion for students. This attitude, surely, cannot encourage the librarian. Even unskilled help to paste labels on book pockets, date slips, etc. is not available to him. Much of his energy is thus wasted in routine drudgery, and little remains for the exercise of imagination and creativity that his profession demands. Seminars and refresher courses should be organized to keep the librarian in touch with recent developments in library science. □



# Reference Service in School Libraries

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S L VERMA  
Documentalist, NIE Library

SCHOOL GOING CHILDREN are irrepressibly curious. Harsh discipline at school or home smothers their lively curiosity instead of channellizing it into creativity. The library is the only place in a school where a child can choose what he wants, consult books on any subject at any time and seek the guidance of the librarian, who does not wield the proverbial rod. A student who reads only the prescribed books no matter how diligent, will remain ignorant of all that is outside the text books.

The purpose of the library is to supplement classroom instructions. The purpose of the school is to impart education to children by helping them find their way to the various branches of knowledge.

## EDUCATION AND THE LIBRARY

What does education mean? There

are three major objectives of education:

- 1) Induction of the child into the life of the group;
- 2) Preparation of the child to face the problems that arise in the course of his later life;
- 3) Helping the growth of the child's personality along its own lines.

To fulfil those objectives, a well-equipped library with reference resources is needed. The services of a librarian who is always prepared to help the students is also required. A sound reference service is a must in a school library

## *Reference Service*

Reference work has been defined as "Direct, sympathetic and informal personal aid in interpreting library collection for study and research" (Wyer). This is a definition from the librarian's point of view. From the student's point of view,

it is a process involving fact-finding and problem-solving on his own with the use of the tools the library offers.

### *Need of the Reference Service*

Most of the students at school and college are not familiar with "Reference Work". It would not be out of place to cite an experience. A Research Assistant (M.A. in Economics and Sociology) came to a library and asked for the International Encyclopaedia of Social Science. When the almirah which contained the set was shown, she was totally at a loss to proceed with her inquiry. The term she wanted to check up was elicited from her and the appropriate volume given but still she could not make use of it. Embarrassed at not being able to go about her work, she said she had never consulted an encyclopaedia and did not know how to use a reference work. She was practically taught to use the encyclopaedia.

The following are the aims of the service in a school library.

- 1) To guide students in their choice of books and other material required both for personal and curricular purposes;
- 2) To develop in students skill and resourcefulness in the use of books and to encourage the habit of personal investigation,
- 3) To help students establish a wide range of significant interests;
- 4) To encourage a lifelong interest in books.

Without effective guidance beyond the conventional school assignments students mostly tend to read thrillers and light entertainments. With proper guidance they can be instructed to follow the news and to satisfy their curiosity about

important adolescent questions involving sex, choice of careers, problems of personality, etc. This will help in satisfying the children's curiosity and developing a confident personality by the end of the secondary level, this maturity will help a student choose a career and make a living.

### *Types of Reference Service*

Students' questions give some indication of stock of books a school library should have. Unfortunately, no sufficiently extensive compilation of questions is available on which to base accurate generalizations. Much depends on the nature of the curriculum and the resources of the library. Some significant clues are furnished in a study made by Davis (1942) "Reference Questions in a Senior High School Library", which can be categorized into.

#### A. FACT-FINDING

Common to the adolescent who needs the answer in about five minutes. Reference work is minimum when enquiries refer to a name, data, title or author of a book, biological, geographical or literary information, etc. Reference tools such as "fact books" answer such questions.

#### B. MATERIAL FINDING

Calls for information on a specific topic, collateral reading or a report. Sometimes the librarian would have to start a long hunt. For answers, to such questions, it may be necessary to consult background material like encyclopaedias, year-books, readers' guides, etc.

#### C. PERSONAL INTEREST SEARCH

Such questions are entirely of personal nature and are related more to a person's common sense, humour and

extensive knowledge of men and matters. In such cases reference books may not be necessary.

### PREPARATION FOR REFERENCE SERVICE

To prepare himself for reference service, the librarian may take the following steps :

#### I BUILDING UP OF A QUESTION BANK

Questions should be compiled:

1. based on class assignments;
2. motivated by class discussion;
- 3 based on personal interest not connected with classwork.
4. based on personal reading exclusive of assignments;
5. based on extra curricular activities such as school newspapers, debating, sports, etc.

This task can be performed by the librarian with the help of teachers. After reading each chapter of the book, questions can be compiled. The teacher should then assign the questions and give the references to the students, who will go to the library to complete the assignments. If this method is followed, students will come across many other books and reading material apart from their prescribed textbooks. This will stimulate their thirst for knowing more and more and will develop the habit of self-study.

#### II PREPARATION OF BIBLIOGRAPHIES

Bibliographies help the librarian in answering queries. For a good reference service these are very handy tools. Bibliographies on different subjects and

topics, keeping the curriculum in view, should be prepared by the librarian with the help of teachers. Students should also take part in the preparation of bibliographies. Students can be given assignments during the library period or in the class to collect references on various topics. While preparing entries for the bibliographies students can be made familiar with the rendering of entries and use of indexes of different types.

#### III LIBRARY PERIOD

The school time-table must have a library period in which the librarian should make the students familiar with library system, use of the catalogue, classification numbers, shelf arrangements, issue system, and library rules and regulations.

#### IV PRIZE FOR BEST LIBRARY-USERS

The librarian should compile statistics on library users at the end of the year. A test on how the library should be used may be conducted and three attractive prizes given to the students who secure the first three positions. This will boost library attendance.

Visual aids have much more appeal for the school child than the printed word and as such most of the reference material used to answer his questions should contain sufficient illustrations. Compton's Encyclopaedias, Oxford Junior Encyclopaedia, illustrated dictionaries, large atlases, globes and illustrated books must form a part of the reference collection of a school library. Attention should be given to the get-up of the books acquired for the library as well as their content. They must be pleasant to handle and easy to read. Reference tools for different age-groups in the Indian languages are yet to develop.

## CONCLUSION

Self-education is impeded by the system of examinations and lack of knowledge in using books to collect information on one's own. The curriculum should be so designed that students have to make

frequent use of the library. The teacher and the librarian should collaborate so that the pupil develops on his own. A good reference collection and a librarian with missionary zeal can go a long way in improving school education □

# Importance of the School Library in the New Educational Pattern

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SYED HUSAIN RAZA NAQVI

Chairman

Central Sectional Committee, School Section,  
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PSYCHOLOGISTS have affirmed that childhood is the most impressionable period of life. The child's mind is always ready to receive new impressions. His senses remain very active. Books, especially illustrated ones, have a lasting impact on a child during his formative years. That is why libraries in the primary schools are considered a must by educationists. In developed countries the library is an essential part of a school. It widens the children's mental horizon by making available supplementary and general knowledge books. Qualified librarians are required to run a library well. Technical qualifications, however, are not sufficient for a librarian. A librarian should be patient, zealous, and scientific in his approach.

In the school libraries of the pre-independence era, books were dumped

without any proper classification. It was only in 1952 that the Mudaliar Commission emphasized the importance of school libraries and recommended trained librarians for schools. More improvements were suggested by the Library Advisory Committee (Sinha Committee) in 1959-60. Later on, in 1964-66, the Kothari Commission recommended that school librarians should be treated (financially) on par with school teachers. Things have improved further with the adoption of library science as a discipline in the new educational system of the Central Board of Secondary Education.

During the last two decades much has been done to improve library services. All the same, there is still scope for extension and diversification of these services.

The librarian alone cannot do much.

The help and support of the Principal and the teaching staff of the school is essential. The new educational pattern makes the school library a cooperative effort and expects different school personnel to share their respective roles to make it more effective and functional.

*What should the Principal do ?*

In order to improve the school library, the Principal must follow the following directions :

1. He should read books on library science so that he may understand the basic techniques to run a library. Such a reading will help him understand the views of the librarian and to chalk out a library programme for the benefit of the teachers and the students.
2. He should endorse a library programme that broadens and improves the quality of education for all children and interpret this programme and its services to the teachers and parents.
3. He should tender his cooperation to the school librarians in designing the library programme best suited to the needs of the school.
4. He should encourage all students and teachers to use the library resources effectively.
5. He should arrange frequent meetings between the teachers and the librarian to plan a systematic and integrated programme of library instruction for all students.
6. He should make himself familiar with school library standards and use them as guides in evaluating the school library programme.
7. He should depute the school librarian to faculty meetings and curriculum committees so that

the librarian may be able to design a library programme to suit the needs of curriculum.

8. He should keep the school librarian informed about educational developments.
9. He should have administrative authority over the school library budgets.
10. He should endorse a policy for book selection and purchase of audio-visual material and recognize the competence of the school librarian in this area.

*What should the teacher do ?*

In order to teach the pupils to appreciate human values, and to inculcate among them a love of books, every school teacher must cooperate with the librarian in the following manner:

1. The development and growth of a dynamic library programme is possible only when teachers and librarians work together in formulating library policies, in selecting library material, in stimulating and guiding the reading of students, and in enriching classroom instruction through the effective use of library resources. The most important single factor determining the success of the school library programme is the extent to which teachers motivate their students to use the library and its resources. The teacher can make the library useful to his students through his knowledge of the library's programme and resources. It is, therefore, essential for the teacher to be familiar with the instructional material available in the library.

2. The teacher should motivate his students to make use of the resources of the library for classroom work as well as extra-curricular assignments.

3 The teachers should participate in the formulation of school library policies by serving on or communicating with the library committee

4 The teacher should participate in the selection of material for the library, especially for the collection in his own specialized field.

5 The teacher should accompany the students to the library and guide their reading

#### *What should the librarian do ?*

New educational trends, new instructional techniques, and many diversified uses that students may independently make of books and other reading material, offer the creative school librarian almost limitless possibilities in planning and implementing the school library programme.

The librarian's duties are comprehensive, including at various times those of the teacher, the specialist, the departmental head and the administrator. In order to perform his work successfully, he should possess the following qualities

1. He should be able to adjust well

and work harmoniously with the children enrolled in the school and the teachers.

2. He should have a thorough understanding of the reading programmes and instructional methods employed by teachers.

3. He should have an extensive knowledge of books, especially those appropriate for the age-groups with whom he is working. He should also be familiar with audio-visual material which can be used by students and teachers.

4. He should have the administrative acumen that is necessary for the running of a library.

5. He should have cultural interests.

6. He should participate in the activities of local, state and national library associations

7. He should have a working knowledge of reference sources.

It is not necessary to state what the children should do, because if the principals, the teachers and the librarians observe their codes of conduct, there is no need of further directives to the children. They will work in harmony with all of them. □

## BRING THEM TOGETHER

Books are the catalytic agent -  
if we borrow the chemist's lingo--  
that makes new quantities  
out of the adult and the child.  
And this agent acts well  
on a child. School is the lab  
where such experiments  
take place. Look out East,  
look out West. Children  
and books, when mixed together,  
create a third quantity—  
informed, thinking adults.

The problem is to bring  
the children and books together  
The problem is to build up  
libraries where this meeting  
may take place. The problem is  
to plan education. The problem is  
to evolve a system in which schools  
and libraries complement each other  
Invariably.

The problem is  
being solved now...  
in other countries...and in India.  
They are bringing the children  
and books together ..





in Mexico .

...in Japan...





...in the U.S.A. ...



. in Czechoslovakia ..

*Photographs U.N. Information Centre, New Delhi*

# How to Make Students Library-Conscious

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THE FOLLOWING article suggests ways and means of making the students library-conscious and shows who are responsible for making them so. It also shows the relationship between the students and the library and the difference between a school library and a college library.

## *Introduction*

Nowadays libraries have cropped up everywhere, but how far these libraries are being used by the readers is a debatable question. And it acquires a kind of research to answer the question. Because libraries are of many kinds, serving different disciplines and trades. However, a literate person has to keep in touch with a library, whether he regularly uses it or not.

At present, the problem is how to make the students more library conscious. This concerns primarily the school and college libraries. If at this stage our students are persuaded to use the library

for classwork and homework, we can reasonably hope that they will develop a habit of consulting a library in their future life also. In this connection I feel the main responsibility lies with the educational authorities of schools and colleges, where tomorrow's citizens are being trained.

Because, without compulsory assignments and instructions from teachers, there are very few students who study the books pertaining to their courses. There are students who are interested in studying books other than those included in their syllabi (i.e., novels, etc.) and they use public libraries. The habit of attending school or college libraries must be developed in the students by the teachers, especially by assigning some work for which they will have to consult a library.

## *The Library and its Relation to Students*

There is a lot of difference between schools and colleges. Schools and

colleges are institutions where the teaching-learning process is involved. But in the library, only self-study and on demand help from the librarian is involved. In the schools and colleges, students are taught only what pertains to a particular syllabus. But in the library there are no such restrictions. A student is free to read books on any subject.

School and college-going students will have to depend on the libraries of their own schools and colleges especially for their assignments such as essay writing, reference work, etc. However, students who take up advanced studies such as research work or writing articles or books, cannot depend on a single library. They have to consult libraries before they can get sufficient material to complete their research.

### *Teachers' Role*

Teachers, while making their students historically and socially conscious, must also make them library conscious. Because this is the backbone of the education and knowledge. Once students become library-conscious, they will take to consulting books in libraries and will develop into good scholars.

### *Suggested Measures*

1. A library hour should be observed in schools.

2. School students should be asked to write on current topics for which they should be asked to consult some books and journals available in the library.

3. Some reference work should be assigned to school going children. They may be asked to find out dates of events or the location of cities, mountains, lakes and rivers, etc. This is only to make the students use the reference books of the library so that they might understand their utility value.

4. School and college students should be given periodical tests in general knowledge, so that they make it a habit to read newspapers and periodicals regularly. This will ultimately make it easier for them to appear in competitive examinations.

5. Their performance in these activities should be assessed and the marks secured included in the progress cards.

6. Debates should be arranged for high school students and prizes awarded to the best speakers.

7. College students should be awarded prizes for their reviews of books and articles to encourage them to develop the art of writing.

8. Students should be issued books they can take home to read.

9. Books recommended for purchase by the students should be added to the library.

10. The school and college authorities should arrange students' meetings periodically to discuss possible improvements in the library. This is to make the students consider the library their own responsibility.

11. Book exhibitions should be arranged periodically in schools and colleges.

12. Extension lectures concerning the students' curriculum should be arranged in the school and college library halls.

13. Now and then, documentary films should be shown to the students of schools and colleges.

14. The library should be kept open at least 12 hours, i.e. from 8.30 a.m. to 8.30 p.m., so that students may use it before and after school and college hours.

### *At the School Level*

The school is a second home to boys and girls. Primary, upper-primary, and high school are the three stages of school

education Library material and its use should be taught to the student step by step, according to the stage of education.

### *Primary School Level*

A primary school should have a children's library which should have all the material children are likely to be interested in. For the primary section of a high school or middle school, a children's section should be maintained in the library. The books and other material in this should be shown to the children and they should be taught the rules and regulations of the library as soon as they are admitted. During the library hour, the children should go through illustrated books. The library hour should be fixed once a week for every class, in order to avoid a heavy rush and inconvenience to the children.

### *Upper Primary School Level*

In the upper-primary school also, children should be introduced to the library and its rules and regulations as soon as admissions are over. They should be assigned some reference work to improve their general knowledge. Assignments should be given once a week to each section of the class, and the children should be instructed to complete it in their library hour. They should be given marks after holding a general knowledge test once a month.

However, the assignments given to the students should not be the same. The class should be divided into batches, according to the strength, and each batch should be given a different assignment.

### *High School Level*

At this stage the students should be given assignments like essay writing. Debates should also be held once a week for each section of the class. The topics

assigned for essay writing should also be different for each of the batches of the class and students should be given marks that would be included in their progress cards. There should be no compulsion for these students to complete their assignments during the library hour, but they should complete it after their school hours when the library is kept open.

High school students should also be issued books they can take home. Student representatives should be called to meetings to discuss library improvement.

For all these three sections of school students, the school authorities should arrange the screening of educational documentary films once a month in the school library. Book exhibitions should be arranged at least once every four months.

### *Librarians' Role*

As soon as the teachers instruct the students in the use of library material, the students will come to the library to work on their assignments. At this juncture it is the duty of the librarian and his staff to mingle with them, try to solve their problems, and make available relevant material. Apart from the library's available resources, material may be borrowed, if necessary, from other libraries on inter-library loan basis. If students have difficulty in finding a book, the library staff should help them promptly. In this manner, the librarian and his staff can play an important role in improving the students' habit of attending the library and using library material.

If these suggestions are considered and implemented by the authorities, students will definitely become more library conscious and will be benefited in the preparation for their higher studies and future careers. □

## Thirteenth Training Course for Educational Planners and Administrators\*

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*Subject* : THE PLANNING OF  
SCHOOL LIBRARY  
SERVICES

*Lecturer* : A.S. Seshan

*Date* : September 12, 1972

LIBRARY SERVICES in several Asian countries are at various stages of development. In many countries, there is a national library, university libraries, a number of school, college and public libraries and often libraries attached to government and non-government research institutions. In a few countries there are also scientific documentation centres set up with the help of Unesco. However, these libraries are not planned as an integral part of the educational, cultural and scientific development programme of a country or a region.

Planning primarily means deliberate resource allocation, taking into consideration the available resources, needs, objectives and priorities.

In the context of library development, planning means, "studying the goals and determining library needs in relation to the economic and social development of the country. Without planning, most library systems will remain poorly organized and equipped. [they would be] unable to win political support and obtain the resources that are essential to them if they are to develop in concert with national education."

We shall not go into the techniques involved in library services planning. Suffice to say that they are in many ways similar to educational planning techniques, possibly with fewer constraints attached to them (The paper on "*Planning Library Services*" by C.V. Penna may be consulted for more information).

Library services are planned at two separate levels, taking into account the structure of education. The universities are independent organizations, and special libraries and documentation centres belong to different specialized research organizations, whereas the school libraries and public libraries generally fall under the purview of the Ministry of Education.

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\* The course, sponsored by Unesco, was conducted at the Asian Institute of Educational Planning and Administration, New Delhi, from July to December, 1972.



However, this division into two levels is only for convenient programming and financing purposes and should in no way imply any separation between them. The link between these two levels must be provided by a central agency, usually the national library of a country.

The main purpose of the national library is to preserve the nation's library output, to support its bibliographical services, and to help in the acquisition of publications, including periodicals, among the libraries covered by the plan for the development of library services. Public libraries provide reading material and reference services for the whole of the literate population. They also provide support for literacy and adult education campaigns and for formal education. School libraries help implement the educational programme of schools.

Although school libraries do not contribute significantly to a national system of library cooperation, in small towns and villages, they might, in addition to in their obligation to the school, assume the functions of a small public library. A similar reciprocal function may also be assigned to a public library which, in the absence of suitable school libraries in the region, may cater to the needs of schools.

#### WHO SHOULD PLAN

As educational planning is not the sole right of the educationists but more of an inter-disciplinary process, so too the planning of library services involves more or less a partnership between knowledgeable librarians, educationists and development planners. There are not many librarians who have given much thought to library planning. There is a lack of know-how and experience. Here Unesco is trying to fill the gap by organi-

zing courses for suitably qualified librarians. It is also arranging for experts to go on missions to various member states in order to help in the planning of library services.

#### LIBRARY PLANNING BOARDS

In almost all the countries where educational planning is being undertaken there is usually a central body which draws up the educational plan for the country. "The planning of educational libraries and public libraries", Mr. Penna says, "has to proceed in close association with educational planning". The Experts' Meeting on National Planning of Libraries in Colombo (1967) recommended that "a strong representative central" body was essential for coordinated and efficient library planning and development of all types of libraries in a nation. Steps should be taken to ensure the enactment of necessary legislation to establish a central authority responsible for the general development of all library services in a country. Such legislation should stipulate the constitution and functions of the library authority at all levels—national, state, district and local—and provide an assured basis for library finances."

As a first step, however, a qualified librarian should be appointed on the educational planning authority, and he should be given the responsibility for preparing library development plans.

That there is a need for a central agency to coordinate and develop library and information services has been acknowledged even in the advanced western countries. In 1966, President Johnson appointed a National Advisory Commission on Libraries to "appraise the role of libraries for scholarly pursuits, as centres for the dissemination of knowledge, and as components of the nation's rapidly

evolving communications and information exchange network." The report of this commission recommended the establishment of a mechanism, whether a national commission or governmental agency, that would be instrumental in developing a national library and information service plan.

In the model library plan for Ceylon drawn up by Unesco, there was a proposal for an independent statutory authority. This proposal was accepted by the Ceylon Cabinet which voted the needed funds and passed the necessary legislation for the establishment of the Ceylon National Library Services Board.

#### THE SCHOOL LIBRARY SERVICE

As was pointed out earlier, the public libraries and school libraries belong to the same level of library planning. The school libraries, however, have their own network, complementing in a minor way the work of public libraries.

How would a unified library service benefit all the schools? According to the Ceylon library plan, the school library service, directed from a central agency, would :

- (a) provide centralized selection, purchase and processing of books ;
- (b) ensure that there is a sound basic collection in each school ;
- (c) build up an educational library, particularly to provide material for teachers ;
- (d) prepare a monthly annotated and graded list of recommended books, from which schools could select books for purchase with their own funds ;
- (e) gradually build up a circulating stock ;

- (f) arrange for visits to schools to assist in library operation ;
- (g) conduct training courses for teacher-librarians ;
- (h) look after audio-visual aids

#### STANDARDS

For the efficient functioning of a school library service, it is necessary to formulate a set of standards for the maintenance and management of school libraries. Such standards would reveal the following unit-costs of the library service .

- 1 The number of books per pupil to be supplied to schools at different levels (this number must be based not only on technical and economic factors but also on the number of suitable books available).
- 2 The frequency and scale of exchanges of book stock.
- 3 Additional services provided, such as loan of audio-visual aids, etc.
4. Initial training and inservice training provision for teacher-librarians.
5. Provision of reading room facilities for an agreed proportion of pupils.

From these standards it should then be possible to apply :

1. Estimated capital costs, maintenance costs for buildings and other maintenance costs.
2. The cost incurred for the various grades of professional staff.
3. Other administrative costs, transport costs, etc.
- 4 The cost per book, which will vary from primary to secondary schools.
5. Book-binding costs.

Thus initially, the total needs of the libraries should be estimated and the

provision to meet these needs suitably phased. These costs may be expressed as a proportion of the total education costs.

Other standards may include various physical and qualitative criteria. The standards set by the American Association of School Libraries could be cited as a model of thoroughness.

#### AN EXPERIMENTAL PROJECT

Here, we may give a brief description of the Unesco/Government of Honduras experimental project on school libraries and the training of school librarians in Central America started in 1967. The aim of the project was to improve the quality of education in primary schools and the professional and cultural preparation of teachers and also to arrange for school libraries to function as public libraries where necessary. The project has so far been able to provide centralized administration of technical services (classification and cataloguing of books), supervision of school libraries, training of school librarians and organization of a pedagogic library.

Further, book stocks and staff for four types of schools are being provided :

Type A (over 900 pupils), 1000 volumes, full-time librarian.

Type B (500 to 800 pupils), 700 volumes, full-time librarian.

Type C (300 to 400 pupils), 500 volumes, part-time librarian.

Type D (100 to 200 pupils), 300 volumes, part-time librarian.

Sixty per cent of the pupils' books are for reference and study and the rest for recreational reading. Teachers have special collections. Reading-room accommodation is provided to five per cent of the pupils at 2.5 sq. metres per pupil.

Rural schools with less than 100 pupils receive circulating collections administered

by teachers. By 1972, that is, in the first four-year stage of development, 396 school libraries serving over 227,000 pupils were to be covered. The Ministry of Education of Honduras allocated 1.5 per cent of its total education budget for the primary school library service.

The Meeting of Experts on National Planning of Library Services in Asia (Colombo, 1967) had recommended 2.1 per cent of the total expenditure (excluding capital expenditure) on secondary education to be allocated for library services. A higher percentage was suggested for secondary schools because in these schools, books in foreign languages were used by the students to a larger extent than in the elementary schools, where the medium of instruction was mostly the mother tongue.

Having thus envisaged what a unified school library services could do and what proportion of expenditure on education may be allocated for it, we are now in a position to take the first steps in implementation—provided of course the necessary legislation has been passed and funds voted.

Obviously the first step would be to organize and establish a unit or headquarters for the school library service. This may be set up under the ministry of education and should have a responsible librarian and administrator to lead it. He would, with his staff, set about surveying the schools in the country or the region and assess their needs.

At the same time he would also be busy in building up a representative collection of school books available in the country and perhaps with some foreign funds import suitable books and audio-visual aids. Simultaneously he would propose a training course for teacher-librarians in order to train them not only in the technical processing of books but,

more important, in the art of book promotion. The profession of the teacher-librarian is unique since he has to fulfil the roles of both a teacher and a librarian. A librarian without teaching qualifications or a teacher without library training would not be suitable for the work. With the help of curriculum experts, the librarian would sort out collections of books useful for individual school libraries. These would be only the initial steps. Once the headquarters starts functioning well, the school library service would be ready to cover schools in the immediate vicinity. As the service grows, demonstration libraries could be set up in other regions. The objective should be to cover the entire country within a span of 10 years. As I said earlier, it is not my intention to go deeper than this, for the purpose of the lecture is more to enlighten the educational planner than confuse him with technical details. When we plan the school library services for Garudaland, we shall discuss some of the details involved.

#### THE BOOK FAMINE IN ASIA

It is said, although it cannot be substantiated, that any book or article that appears in any part of the world is at once translated into Japanese. I am sure it is a highly exaggerated statement but it certainly shows that publishers in Japan do a thriving business and that the Japanese read a lot. However, that is not the case in many Asian countries. While in advanced countries newspapers have a circulation of over two or three million, there are few in the developing countries that have a circulation of even 100,000. This also goes for books. Apparently, publishing in Asia is not a lucrative business. The reason for this is two-fold. When many countries became indepen-

dent, not enough attention was given to education. Secondly, the local language was made the medium of instruction. In countries which are multilingual like Ceylon and India, the problem of book production in several languages became enormous. Unesco has taken again a lead in the last five years. To study the development of book production and distribution, it convened meetings of experts to examine the problems in Asia (Tokyo, 1966), Africa (Accra, 1968), and Latin America (Bogota 1969).

The meetings recommended that 'book development councils' draw up national plans and draw the attention of governments to specific needs. But particular stress was placed on the development of a systematic network of library services. A well established library network can provide a guaranteed market for books, which makes all the difference to the profitability of a publishing venture. This is especially true of children's books. "Good children's book publishing can provide the essential basis for securing functional literacy age, and at a higher level, the existence of scientific and technical writing in local languages can stimulate interest and lead to reader acceptance of technical innovations.

"The educational planner and the library planner in the developing countries, therefore, are vitally concerned with the growth in national book production and distribution".

#### INTERNATIONAL BOOK YEAR

Unesco designated 1972 as the International Book Year and selected four themes for the year: encouragement of authorship and translation, with due regard to copyright, production and distribution of books, including the development of libraries, promotion of the

reading habit ; and publication of books in the service of education, international understanding and peaceful cooperation. Dr. Malcolm Adiseshiah, now the Director of Madras Institute of Development Studies, urged the launching of a national book plan for India. He said that India produces only 22 titles per million of population, compared to 32 per million in other Asian countries and 418 in Europe.

India's annual book production was around 12,000 titles with about 48 million

copies. This was less than three per cent of the world figure. He appealed to the Central and State Governments to allocate more funds for the acquisition of books by libraries, educational institutions and research centres. In his plan for assuring books for all in the next decade, Dr. Adiseshiah said that India should produce 144 pages per person per year, to be distributed by 70,000 libraries. In the second phase, production of general books should be increased from four to 48 pages per person in the next decade. □

# Psychology of Audio-visual Aids

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HUMAN KNOWLEDGE in our age is increasing at a tremendous rate. This knowledge is to be communicated through the various media of communication. Communication has therefore assumed singular importance in this age.

Man's thirst for knowledge has existed since the beginning of civilization. In the past, information was passed on by verbal message, which was then almost the only means of communication. But today we have many scientific communication devices. Now information can be imparted to people in distant lands in a matter of seconds. The modern methods of communication indicate man's successful efforts to establish contact among individuals, societies and nations.

Currently, audio-visual aids are being used as effective instruments for the communication of knowledge. Schools are making increasing use of these aids. Teaching is a two-directional process,

which involves sharing of knowledge between the teacher and his pupils. It is a process by which knowledge, ideas, skills and attitudes are developed in the pupils. Communication is thus the very essence of education.

The aids and material which help us to learn effectively through our auditory and visual channels are called audio-visual aids. The auditory aids are the instructional devices which help us to learn by hearing. The visual aids are those which communicate information through images. The audio-visual aids exploit both sight and sound in the task of communication.

How are such aids related to learning? The spoken word is transmitted to the brain through the ear and influences the memory and the motor area. Whatever sense may be involved in passing on information to the brain, we always go through an experience which engages one

or other of our senses in the process of learning. We have a direct experience when we see a rose, touch it and smell it. It becomes an abstract idea when we hear the word 'rose' or see it in print. Our teaching devices must communicate ideas directly. Our audio-visual aids should therefore create less abstract and more real situations in learning, i.e. the experience they convey should be direct rather than abstract.

The primary purpose of the teacher in the classroom is to help the learner in the acquisition and retention of knowledge, as well as to help him acquire skills. Audio-visual aids help the learner, motivate learning and develop the capacity for clear thinking. The students not only get theoretical instruction but also a graphic presentation of the subject matter through these aids.

The variety of available auditory and visual aids used in teaching has increased tremendously in recent years. Research studies suggest that these aids are not only useful in enriching and vitalizing teaching but also in improving its effectiveness. They help to make a lesson interesting. Lessons taught without audio-visual aids do not substantially increase the range of students' interests.

These aids will not and should not replace the teacher, but will make the teacher's job easier and result in more effective learning. These aids stimulate learning, excite the spirit of enquiry, create pedagogical situations and make learning an intellectual adventure. They can be employed to aid pupils in critical thinking, which is the basis of the higher forms of learning. They provide proper motivation and afford adequate drill. They help the triangular process of learning—motivation, clarification and stimulation. The following are the main advantages of audio-visual

aids in education.

### *Potent Motivators*

Motives are fundamental to the learning process. Learning will proceed best if the learner is motivated. The most effective learning takes place when there is strong mental activity, which is best attained through strong motivation. *The child is likely to forget when the motive for learning is absent, when the thing to be learnt appears unimportant, when it seems to lack any relationship to his life—in short when it has no significance for the child.*

Most of the teaching in our schools is verbal and ineffective. A verbal explanation supplemented by a visual aid is far more effective in attracting attention and creating interest than if it is imparted without any aid. If a lesson is presented with the help of audio-visual aids, it adds variety and breaks the monotony of ordinary classroom instruction. The real life situations presented through these aids arouse curiosity and hold attention. The concentrated attention and sustained interest developed in this way are vital to learning. The child concentrates on what he sees. His world is a sensory-motor world; he is interested in things that he can see, hear, touch and taste.

### *Aid in Retention*

It has been observed that loss of retentivity occurs generally due to the following factors :

1. The child forgets all that seems unimportant and purposeless.
2. He forgets when he cannot form an image of what is being taught to him.
3. He forgets when he does not make use of what he has been taught in his daily life.
4. He forgets when he does not get

sufficient lesson drill.

It has been found by researches that human beings learn more easily and faster by audio-visual processes than by verbal explanation. Extensive but judicious use of aids is a necessary adjunct to effective learning. Learning that is acquired mechanically is retained with difficulty, whereas rich experiences are almost always remembered. The mental images created by pictorial stimuli and models are easy to recall because of the intense interest at the time of reception. Children are more interested in the realistic and concrete than in the abstract and symbolic.

### *Help in Forming Images*

The verbal presentation of a lesson without the aid of models, charts or photographs is not very useful. A picture

or a model must be used to supplement the explanation. Image is an useful instrument of instruction. Sensory images leave behind impressions that are more abiding than verbal ones.

Audio-visual aids facilitate the acquisition and retention of information imparted through the lessons. While using audio-visual aids, however, the teacher must take into consideration the characteristics of his students and their intellectual needs and interests.

Education should be imparted to children as effectively and attractively as possible. Audio-visual aids are being used widely at all stages of school education in advanced countries. In India, where the teacher-pupil ratio is nearly 1 : 50 and most of the schools have varied curricula, these aids can deliver the goods, if used judiciously. □



# Exchange of Information on Scholarly Work in Indian Universities

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A NUMBER OF Indian universities and research institutions are engaged in scholarly work in the various science disciplines. As in the case of universities in the western countries, a few institutions issue the preliminary versions of manuscripts in the form of working papers, staff papers, occasional papers, research papers, etc. in cyclostyled form. The wrappers of these papers are sometimes printed, giving titles, names of the authors and the affiliated institutions. Individual institutions maintain a list of faculty working papers and send a catalogue to scholars and other institutions interested in the research work done by them. Due to a number of reasons associated with the publication of the papers in academic journals in India and abroad, some of them are never published. In this article, an attempt is made to suggest the introduction of an exchange system in Indian

universities and research institutions on research work done by them.

## *Working Papers*

The papers written by authors in universities and research institutions are called by various names, viz. working papers, research reports, research papers, technical papers, staff papers, occasional papers, technical reports, etc. These papers usually represent the first written report of research done at the university departments. They may be read at professional society seminars and meetings or intended for eventual publication in journals or as chapters in books. Also, speeches by faculty members are included in this category. Sometimes technical reports represent 'publications of record' for works which might not otherwise be available. Among other things, they include the basic documentation of research

methodologies and computer programmes for teaching and research.

### *Practice in Western Universities*

Before suggesting a viable scheme for the exchange of scholarly information among educational institutions in India, the existing practice in universities in the West may be discussed. Normally all university departments issue working papers in photocopy form, though some of them are printed. Reprints of articles published by the faculty are ordered from the publishers for distribution to interested people outside the university. Besides universities, other institutions like the World Bank, research departments of the central banks and other statutory organizations like the Federal Reserve Board and the Federal Home Loan Board in the United States follow this system. Single copies of working papers and reprints are supplied either free of cost to bonafide research scholars till stocks last, or a nominal rate for photocopying services is charged.

Besides, publishers of journals like the *Harvard Business Review*, *The Banker*, etc. also issue reprints of selected articles and sell them to interested people. Most of the publishers of journals in America have an arrangement with University Microfilms at Michigan, USA, for issuing xeroxed copies of articles published in their journals at a nominal cost. Some journals, such as the *Journal of Economic Literature*, *Sociological Abstracts*, *Current Contents*, etc. index articles currently appearing in various periodicals. The names and addresses of authors are also given so that interested readers may correspond with them. This system is restricted to journal articles only and not for working papers. However, periodicals such as *Econometrica*, *Management Science*, etc. issue a list of working papers

produced in universities in the USA and in Europe. The Baker Library of Harvard University issues a quarterly list of working papers received from various universities and charges an annual subscription of five Dollars. The Association of University Bureaus of Business and Economic Research based in Colorado, USA, issues an annual catalogue of all the working papers issued by its 110 member business schools. Also, there are a number of periodicals specializing in bibliographic work, for example *World Agricultural Economics* and *Rural Sociology Abstracts* published by the Commonwealth Bureau of Agricultural Economics, giving adequate coverage of articles and working papers relating to various disciplines.

### *The Indian Case*

The main aim of our academic institutions—universities, research institutes and others—should be to disseminate information on their research activities for the benefit of interested research scholars working in other institutions. The latter can then not only be kept informed on the research activities but can also correspond with the authors concerned, should they be interested in particular research papers. The author of this article recently came across a report prepared by Raymond Fernandez of the Xavier Labour Research Institute, Jamshedpur in 1973 on the performance of the Karnataka State Financial Corporation. The report, which he discovered by sheer chance, was very useful to him for the preparation of a paper on our State financial corporations. Normally, however, such publications go unnoticed, even by researchers for whom they would prove of value. Availability of relevant research material should not be purely a matter of chance.

The practice of issuing working papers has a number of practical advantages.

Normally, authors submit their articles in typed form to periodicals for publication, when it is either published in original/ revised form, or rejected. The author may try some other publication, if he is successful, well and good. If not, quite likely the paper will never be published. This is regrettable, since often such manuscripts are of interest and use to other researchers, though the publishers of periodicals may not be interested in them. Besides, the practice of issuing working papers has other advantages. Firstly, the papers in draft form may be circulated among colleagues for their comments; this enables the author to incorporate possible suggestions and criticisms. The revised version can then be issued in the usual cyclostyled form and be included in the list of working papers, which may be issued in a cumulative form every three months. Moreover, this serves an important function—that of circulating the active academic work done in an institution by its individual staff members. In a university having a large number of students and faculties, it enables students and faculty members to be exposed to the scholarly work done by individuals among them.

It is unfortunate that the practice of issuing working papers and reprints is yet to be developed in our educational institutions where advanced level research work is conducted. Though the ICSSR (Indian Council of Social Sciences Research) publishes bibliographies on various subjects in the social sciences, the coverage is restricted to published works like books, articles, dissertations, etc. It is disheartening to note that no serious efforts are being made by the ICSSR, the

University Grants Commission or by individual institutions to issue the details of research work conducted by them. The combined list of working papers produced in various institutions in India is yet to be issued. The Delhi School of Economics follows the practice of issuing working papers. In the case of sister institutions like the Indian Institutes of Technology and the Indian Institutes of Management, there is a mutual exchange of such information. Unfortunately this system is restricted to sister institutions and scholars in other institutes have no access to such information unless the combined catalogues of working papers and reprints are received in their libraries.

It is suggested that instead of waiting for a central organization to undertake the task of compiling and issuing catalogues of working papers in various subjects in the social sciences, individual institutions in the country may take the initiative in this matter to aid research scholars who badly need such vital information. The ICSSR may include a list of working papers produced in various universities and research institutions in its bibliographies, or may publish a quarterly bulletin of working papers as is done in the case of dissertation work done in Indian universities. Academic bodies like the Indian Economic Association may, in a separate section in their publications, print a list of working papers produced in various institutions on economics.

It is hoped that universities and research institutes in the country will soon do the needful to facilitate exchange of scholarly information among academicians on the lines suggested above. □

# School-Sponsored Social Service

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THE SCHOOL is an age-graded formal institution where normally children belonging to the same age-group acquire specific skills that eventually facilitate their acceptance by society. Thus schools must prepare children for their adult roles in life. Stressing the significant role of social service in schools, the Kothari Commission had recommended: "Some form of social and national service should be made obligatory for all students, and should form an integral part of education at all stages. This can become an instrument to build character, improve discipline, inculcate faith in the dignity of manual labour, and develop a sense of social responsibility."

## *Imperatives of Social Service*

Social service in schools, to be worthwhile and enduring, needs to be related to limited goals of social welfare which could be realized within the range of school

resources and volunteers' capacity. Neither a publicity stunt nor an educational fad, it must not be ceremonial in character. Though considered "an integral part of the school curriculum" under the revolutionary 10+2 pattern of education, it receives scant attention because of its inclusion in the optional list. Thus it does not get the importance it deserves. To make social service an instrument of awareness and change, we have to go beyond occasional visits to slums and the much publicized "cleanliness drives"—duly photographed, filed departmentally, and displayed for routine inspection. The social service programme, if meaningfully formulated and honestly implemented, can become the school's boast and the society's never-failing investment. This process of social investment for remedying social ills can act as a corrective for the youth's alienation from its environment, which breeds snobbishness, unconcern for

the under-privileged, and contempt for the backwardness of the weaker sections of society. Some constructive, socially relevant and materially feasible programme of action will have to be devised and followed on a continuing basis in order to realize tangible objectives, and to break the grip of professional inertia and the inflexibility of the curriculum and instruction.

Before any effective social activity is launched, it would be wise to prepare a comprehensive survey of the field or area of choice. To give it a viable shape, these steps in the formulation of survey are noteworthy :

1. Getting official approval/patronage for the survey.
2. Appointing a steering committee.
3. Designating a survey director.
4. Selecting other survey personnel.
5. Establishing primary and secondary survey objectives.
6. Planning survey publicity at the local and outstation levels.
7. Preparing easily understood survey forms.
8. Fixing up survey procedures.
9. Ensuring flexible following of survey-guidelines.
10. Interpreting survey data methodically.
11. Reporting critically on survey data.
12. Evaluating lapses, shortfalls and lacunae.

13. Consolidating short-term gains, and controlling related areas of operation.

While perfecting the above mechanism of social work, it has to be realized that the guidance programme is a cooperative endeavour, and that total involvement is essential. No piecemeal innovations, no mock heroics to attract attention or solicit applause, no slogans or stunts for cheap popularity, no *tamashas* for self-projec-

tion are substitutes for permanent help. Guidance services are essentially 'identifiable aid'. They assist people to make appropriate choices, adjustments, interpretations and plans. This involves helping people to discover and use their natural endowments so that they may live decently in harmony with themselves and the society.

#### *Scope of School Based Activities*

These activities are neither to be ambitious nor revolutionary. Instead, the programmes of action need to be realistic, achievable, socially necessary, low-budgeted, effort intensive and pupil-satisfying. Such schemes would induce group loyalty and cohesiveness, and promote awareness of the needs of the under privileged sections of society. The following schemes could be taken up.

1. Health and hygiene of class IV school employees (and their families). In ever-widening circles, market dwellers, patients in hospitals, the deprived and disabled on the pavements, near the places of worship, on the farms, in the factories, at the construction areas, mining centres and railway colonies should be taken up.
2. A literacy drive for dropouts, illiterates and adults could be arranged on a continuing basis in manageable groups, without any patronizing, in a spirit of sharing knowledge.
3. An enrolment campaign could be initiated to increase school attendance.
4. Useful crafts and hobbies like knitting, stitching, embroidery, toy-making, typewriting, designing, decorating and painting, plastics, library science, accounts-keeping, correspondence, etc. could be taught. In fact, any productive skill that can enliven the lives of the poor or help them materially in a given context of resources can be taught.
5. Community development schemes could be launched, like making approach

roads, digging a well, a pond or a swimming pool, levelling an area for play-fields, clearing slums, beautifying the precincts of cinemas and hospitals, arranging for the care and comfort of prisoners and the rehabilitation of beggars and destitutes, formulating welfare schemes for orphans and widows, assisting the victims of accidents, pestilence, draughts and floods, arranging for war-widows, and soldiers with artificial limbs or deformities. 6. Social awareness schemes could be popularized, like acquainting people with their civic rights and duties, legal privileges, personal freedoms and social amenities, educating them about social security measures and investment schemes, money-saving plans and safety regulations, insurance schemes and career openings; alerting them against environmental pollution, food adulteration and infectious diseases; guiding them about the representation of grievances and claims, and the modes of redressal. 7. Improving the quality of life by introducing hobbies and leisure-time pursuits like reading for pleasure, writing for creative articulation of thoughts and feelings, etc. The arts of painting, music, interior decoration, etc. could be taught.

### *Benefits of Social Service*

Thus there is vast scope for introducing social service schemes. Similarly, the aspects and dimensions of social service are challenging and rewarding. The school-sponsored social service schemes may not produce Ram Mohan Roys, Ishwarchandra Vidyasagars and Harbilas Sardas overnight, but certainly scientific attitudes can thereby be inculcated. Thus can be formed an assertive minority, which pioneers reform and regeneration, once they are groomed systematically and institutionally in the

ways of selfless service and dedicated devotion to duty. The fruits of concerted efforts in social service are seen tangibly. The gratitude and relief of the beneficiaries are tremendously encouraging. There is nothing mechanical or counter-productive about social service, which is a pragmatic extension of work experience. Personal commitment, and the joys of alleviating suffering and forestalling misery are sufficient rewards.

### *Essence of Social Service*

Social service schemes must be conceived rationally, and executed with controlled enthusiasm. Successful experiments should be popularized and practised extensively. This self-perpetuating process should become an indispensable part of our 'live curriculum'. It must not be practised for the benefit of visiting dignitaries. The pursuit of social service ought to steer clear of celebrations and publicity. It should be directed towards the making of clean, socially-conscious individuals and a forward-looking society.

More than school resources, the collective vision and will of students is crucial to the success of social service schemes. Personal inadequacies and deficiencies of those less fortunately endowed can be corrected, adjusted and reoriented, given the involvement of those who embark on the project. A dynamic drive will instil self-confidence and self-reliance, leaving no room for frustration, gloom and cynicism. Learning about development, like development itself, is an experiential process. By being confident apprentices in development, students can work as agents of change. They would see through the hypocrisy of orthodoxy, masked in radical rhetoric and ritualized conformity. A firm sense

of identity and a struggle for common ends would render school life memorable, and life a trifle more bearable for the victims of inequalities. It would ensure, in a fair measure, the emergence of a dynamic youth leadership. It would inculcate an urge to improvise, experiment and innovate, which is a life-time asset for personal growth and socio-economic advancement. □

# Need for Teaching Literature in Secondary Schools

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LITERATURE IS A PART of the life and culture of a people. It is as much an expression of universal man, of 'eternal varieties,' as it is of the manifold stages in the life of a society or of a nation. It is the stage set for the evolution of the individual. It is "language in a condition of special use"<sup>1</sup>. It is "language outside ordinary time and thus will survive time better," says Ovid, "than marble or stone".

It is language "susceptible of communicating emotions in a sustaining context of conveying beauty. All signals we emit are potentially resonant with values and intensities beyond those of bare information"<sup>2</sup>.

Literature is essentially the product of adult experience and it requires complex powers to produce and understand. The

writer, the 'maker of literature', chooses his linguistic material from the totality of available, expressive means. In any good piece of literature we hope to find aesthetic beauty, moral dignity and psychological utility and its propositions about life are sure to be authentic. The most important function of literature is educational. Because it presents people in their social relationships and engages its readers in much the same way as situations in real life, literature has a very important function in forming attitudes and influencing sympathies.

The writer's medium, language, has its conventions and norms. Verbal gymnastics, calculated to catch the reader's eye and appeal to his likes and dislikes, cannot pass for literature.

Literature helps us to see ourselves in our social and cultural perspective. It helps us to see how our heritage influen-

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<sup>1</sup> George Steiner, *Language and Literature*.

<sup>2</sup> *Ibid*.



ced the present, which indicates what our future could be

The question before us is whether we should teach literature in our schools at all. If we do teach it, we have to decide what kind of literature at what stage should be taught. There is a fair degree of unanimity among the teaching fraternity that the teaching of literature should begin in the mother tongue. It is easy for a child to identify himself with his own people and their ideals and aspirations. By relating himself to his people, he comes to grips with himself and tries to adjust himself to his environment.

With the advancement of science and technology and as a result of the sweeping changes that have been taking place in the social, economic and political structure, societies, both in the east and the west, are caught in a quagmire of modernity. The old order has been replaced by a new order which has failed to keep life on an even keel. Religion, morality and righteousness, it appears, have been thrown to the winds. People may call it the new way of life, but it is certain that most people are not happy with it. Every dawn brings with it the fear of war, floods, famine and starvation. Tension, like a shadow, follows man everywhere.

We are in a rat's alley, "where the dead men lost their bones"<sup>3</sup>. We are frightened of something and we do not know what it is.

"I will show you fear in a handful of dust"<sup>4</sup>, says T. S. Eliot, and he is not far from the truth. Material affluence has brought with it spiritual bankruptcy.

*I have lost my sight, smell, hearing, taste and touch. How should I use them for your*

*closer contact*?"<sup>5</sup>

Man appears helpless. His feet are in the sand. Grand lifeless machines, cigarette butts, coffee spoons, empty tins and broken bottles have become the symbols of modern life.

In the words of Sir Philip Sidney, "the poet is the food for the tenderest stomachs, the poet is indeed the right popular philosopher. Whereof Aesop's tales give good proof; whose pretty allegories, stealing under the formal tales of beasts, make many more beastly than beasts begin to hear the sound of virtue from those dumb speakers"<sup>6</sup>. Literature, thus, has an ennobling influence on the human mind.

Literature has a place in education at all levels. This does not mean that we have to teach Shakespeare and Milton to our secondary school students. In order to read and enjoy a good piece of writing, a person must have a good knowledge of the language. We cannot teach language without coming to grips with its cultural content. "To deal with the culture and life of a people is not just an adjunct of a practical language course, something alien and apart from its main purpose to be added or not as time and convenience may allow, but an essential feature of every stage of language learning"<sup>7</sup>.

English is a part of the general education of students in India. It is a stepping stone to foreign literature and a medium of international communication. Burke, Gibbon and Darwin present the facts and ideas of political philosophy, history and science in a language which is striking for its precision, grace and

<sup>5</sup> T. S. Eliot, *Gerontion*

<sup>6</sup> Sir Philip Sidney, *An Apology for Poetry*.

<sup>7</sup> C. C. Fries, *American Linguistics and the Teaching of English, Language Learning*, Vol. VI No. 1-2, p 14, 1955.

<sup>3</sup> T. S. Eliot, *The Waste Land*

<sup>4</sup> *Ibid*

energy. Its educational value is obvious. Fiction, poetry and drama can be used as potent educational tools.

Along with sound language teaching it is essential to teach English literature to those who are equipped for it. Literature is a help in language-learning as well, and narrative and drama show language in operation. Literature then is both an end and a means. "In the study of language, literature should be there as a handmaiden, just as I believe that literature is best studied when the study of language is to hand as an ancillary".<sup>8</sup>

#### *Pre-requisites*

1. The learners should possess a thorough knowledge of the language. If the piece selected is contemporary literature, proficiency in the language and cultural information are usually sufficient. If it belongs to an earlier period, special preparation and annotation is necessary.

2. One cannot proceed to the study of literature without going into its cultural milieu. "We cannot understand another people's language fully until we see through their eyes those whom they call their heroes; what these people have fought for and what they stand ready to defend against what accomplishments they prize, and what they consider virtuous ...".<sup>9</sup>

3. The learners should be equipped with the necessary tools to understand, appreciate and form judgements—tools such as skills of comprehension, reference skills, etc. "The primary problem is to make the student see the moral implications of studying literature, to encourage him to see literature as a part of the way of life, that reading preposes a certain

quality of life, a consciousness and at least temporary commitment to certain values"<sup>10</sup>.

4. Only suitable pieces should be selected and prescribed. The books selected should be of sound literary merit. They should not be so difficult as to be beyond the pupils' grasp. They should provide the minds of pupils with both exercise and interest. There should be variety. Dull unimaginative reading material cannot act as an incentive to further study of the language, however easy it may be. On the other hand, material which is beyond the grasp of the learners cannot engage their attention, however great it may be as literature. But unfortunately most of the books prescribed for study at different levels are unsuitable. The extent to which this principle is flouted is really astounding.

5. The teacher is as important as the material itself. He should be fully qualified and must have a real love for the subject he teaches. In India most of the teachers of literature do not enjoy literature themselves. Their understanding of literature is peripheral and their teaching is far from inspiring.

6. Literature teaching should neither be language teaching, nor should it be reduced to a kind of vocabulary exercise. The learners should be prepared and motivated to read and discover as much as they can for themselves. This should be followed by well-directed discussion sessions.

#### *Motivating Factors*

It is not easy for an Indian learner of English to understand and enjoy literature in English, however simple it may be. Films, colour slides, music, broadcasts and introductory sketches may be used to

<sup>8</sup> Randolph Quirk, *English Language and Structural Approach in the Teaching of English*.

<sup>9</sup> R. Lado, *Language Teaching*.

<sup>10</sup> E. Wright, *Adequacy in English for Higher Education*, ELT, Vol. XV, No. 3, p. 61

introduce students to an alien culture. Too much explanation will kill the students' interest in the piece. If it is a poem or a short play, an intelligent and sensitive reading by the teacher will do a world of good to the learners.

Achieving a kind of comprehension which is involved in securing and retaining vicarious experiences by imaginative identification with the writer or with his fictional characters is crucial to the effective teaching of literature in schools.

Not all minds, it must be admitted, can appreciate literature. It is said that it is the prerogative of the more intelligent. Of course the less fortunately placed learners may not be able to seek out feeling, tone and intention as complementary aspects of literary meaning on their own. As teachers of literature, we must be able to do rather more than assert the superiority of our own intuition over those of our students, however tactfully, until the learners are capable of 'taking them out of themselves'. □

# Educational News

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## BHOPAL

### *Steps to Improve Question Papers*

The Board of Secondary Education, Madhya Pradesh, has been continuing its efforts to bring about qualitative changes in the question papers. For this purpose, the Board has been arranging one-week training programmes at the divisional headquarters. One such programme of about 35 lectures on various subjects was arranged at Balaghat from January 10 to 15, 1977.

A set of improved question papers on various subjects was prepared in accordance with the content of the lectures on design, types and forms of questions, content analysis, scoring key, etc.

### *Textbook Corporation*

There is no prescribed textbook in science for Classes I & II in Madhya Pradesh. It has therefore become difficult to maintain uniformity regarding level of content, activities to be provided, methods to be used, etc. Seeking to solve

this problem, the Textbook Corporation, through its panel of authors, has prepared and finalized the manuscript of a 'Teachers' Guide in Science. The Guide is expected to reach all teachers in July 1977.

## BHUBANESWAR

Prof. Nurul Hasan, former Union Education Minister, addressed the staff of the Regional College of Education, Bhubaneswar on January 4, 1977. He said that the importance of education was next to the defence of the country. A change in the system of education affects half of the nation's population. He reiterated the importance of educating the masses.

Educational planning, he said, must be geared to the future needs of the society. He said that the distinction between skilled and unskilled workers should be removed by providing non-formal courses of study.

## GOA

*Educational Reforms Planned*

At a meeting of the Education Council held in Panaji last month, the Chief Minister, Mrs. Shashukala Kakodkar, announced her Government's decision to introduce a number of changes and reforms in the educational system

Children who complete five years on May 31, 1977, would be admitted to primary schools, as against the earlier rule which permitted children to be admitted at the age of four years and eight months.

Instead of the mother tongue as the medium of instruction in the Government primary schools, regional languages—Marathi and Konkani for Goa, Gujarati for Daman and Diu, and languages included in the Eighth Schedule of the Constitution, are to be adopted. The Chief Minister made it clear that her Government would discontinue the teaching of English in the Government primary schools after seeking legal opinion on the subject.

Stagnation and dropouts at the primary and secondary level are to be checked and the Government will try to ensure that every student in the Union Territory reaches middle school.

The problem of untrained teachers is to be tackled on a priority basis.

The study of Konkani as a second language in standards VIII to X will continue.

The feasibility of opening a Government high school to teach through Urdu medium would be examined and efforts would be made to promote the study of Urdu in the Union Territory.

The Government would also consider making provisions for the study of Sanskrit in at least two Government schools (to begin with), provided at least

five students are willing to study the subject

An administrative board would be set up to look after the management of Government schools.

The setting up of the proposed Goa University would receive top priority.

## MAHARASHTRA

*Vocationalization of Higher Secondary Education*

The State Government has set up a high-powered committee under the chairmanship of the Additional Chief Secretary to consider problems arising out of the linking of higher secondary education with vocational courses and also to determine the manpower requirements and training needs of the important sectors of the economy—industry, agriculture, transport and communication, irrigation and power, animal husbandry, dairy and fisheries, etc.

The other members of the committee are the Secretaries of the Department of Education and Youth Services, Planning, Animal Husbandry, Dairy and Fisheries, Industries, Energy, Irrigation, Public Works and Housing, Health, Forests and Transport and Co-operation. The Director of Technical Education will be the Member-Secretary of the committee, which will also carry out micro-level field surveys in the district for collection of data.

In this connection, a committee set up under the chairmanship of Mr. A.U. Shaikh to study the vocationalization of secondary education in Maharashtra recommended to the Government in 1973 that vocational guidance work should be expanded so that every student leaving school could get proper guidance about

the choice of a career. The Shaikh Committee had also recommended that the Institute of Vocational Guidance and Selection, set up in 1951, should be converted into a Directorate of Guidance with three hundred Block Guidance Centres functioning under it in collaboration with District Employment Exchanges. The Institute has, so far, helped 7,93,000 young men and women directly and 1,18,000 by proxy. It has trained counsellors and has helped candidates to make the right choice through psychological and aptitude tests.

#### Srinagar

##### *Democratic Decentralization in Education*

As an experiment in democratic decentralization, the first major administrative step has been taken to restructure the district administration in the State. The experiment involves the implementa-

tion of single line administration to eliminate factors which impede the implementation of development projects. The decentralization consists in creation of development boards for each district so as to involve the community in the task of development.

The former Chief Minister launched the experiment in democratic decentralization in Kashmir's backward district of Doda. However, it is going to be extended to other districts to ensure fuller and meaningful participation by the Government and the people in the development of the State. It was the first time a cabinet meeting was held outside Srinagar and Jammu. More such meetings will be held in other district headquarters. The aim of this innovation is to "take the Government to the doorsteps of the people." The State plan of Jammu and Kashmir for 1977-78 was finalized by the Cabinet in Doda. For the development of Doda district, Rs. 4.98 crores has been set apart under the district plan. □

## Book Reviews

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### *Inservice Education to Improve Reading Instruction*

Wayne Otto and Lawrence Erickson, International Reading Association, Newark, Delaware, (Reading Aids Series, an IRA Service Bulletin), 1973 (Second Printing, February 1974), pp viii-47

THE BOOK has been divided into five chapters. The first is an introduction to inservice education. In this chapter, an attempt has been made to deal realistically with the problems involved in implementing inservice programmes as well as to establish the need for them. The authors are of the view, and rightly so, that an inservice programme can unify and motivate educators to work towards common goals. Moreover, an inservice programme can clarify problems and suggest solutions. It can introduce and suggest implementation of new ideas and procedures. These programmes are needed to ensure that reading instruction is maintained, in a lively, dynamic state.

The second chapter deals with the process of inservice planning and implementation. It is a matter of common experience that the results of inservice programmes have been poor. The reason inservice training tends to be dull or

useless is that often the sessions are poorly timed, too general, or too specifically devoted to administrative housekeeping. Harris and Besant\* identified three areas in which serious mistakes are often made. These are (a) failure to relate inservice programme plans to genuine needs of staff participants; (b) failure to select appropriate activities for implementing programme plans; (c) failure to implement inservice programme activities with sufficient staff and other resources to ensure effectiveness.

The main drawback in most of the inservice programmes is that not enough attention is paid to results. The activities are initiated and carried out but nobody worries much about the results in terms of improved instruction. A vague notion prevails everywhere that somehow an inservice programme will be helpful. This appears to be fallacious. The five steps in the process of inservice education should be to:

- identify needs (see what the problems are),
- set a goal (tackle a specific problem),

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\**Inservice Education: A Guide to Better Practice*, Prentice-Hall, Englewood Cliffs, New Jersey, 1969

state objectives (define your goal in specific terms)  
 select activities (consider cost, resources, and participants),  
 evaluate results (see that your goals are reached)

The third chapter deals with staff roles and responsibilities. Consultants from outside the school system can make valuable contributions to inservice programmes, provided they meet the specific needs of the particular programme. To invite an 'expert' for the sake of having a well-known authority may be waste of time. Before an 'outsider' is invited, definite reasons for choosing an individual should be established. As a general rule consultants from outside the system should not be invited unless they do then things more effectively than someone within the system. If a consultant is deemed necessary, and a knowledgeable person who can work well with teachers is available, then an invitation may be offered. The consultant, on his part, should:

insist on knowing what the participants want him to do and how this activity fits into the total inservice design,  
 refuse to accept an invitation when he feels that he cannot effectively do what is required of him;  
 refuse an invitation when he feels that local inservice leaders will not prepare the groundwork for his presentation and will not plan for systematic follow-up;  
 insist on meeting with school inservice leaders to discuss the programme prior to his direct involvement,  
 learn as much as possible about the present practice of reading instruc-

tion in the schools prior to presenting his portion of the programme  
 prepare and present his activity in a manner consistent with the purposes of the programme.

Formats for inservice sessions are presented in the fourth chapter and the strengths and limitations of each are considered. In any successful inservice reading programme the marriage between the specific goals and objectives and the actual activity engaged in by the participants will determine, to a great extent, the success or failure of the programme. In the past, inservice programmes have tended to take stereotyped formats, with much talking to teachers and relatively little effort made to seek the involvement of the participants.

Thelen\* points out that activities in themselves are neither good nor bad; it all depends on the use to which they are put. A surefire activity like the 'group dynamics' technique can fail miserably. A buzz session with nothing to talk about is embarrassing, a panel of reading experts whose expertise is not relevant to the needs of the teachers is maddening, and role playing at the wrong time with the wrong participants can be ghastly. Thelen warns that cautious selection is called for when inservice activities are planned and offers these as guidelines for matching activities with objectives:

1. What main objectives is the activity supposed to accomplish?
2. Under what conditions does the activity actually work successfully?
3. What undesirable things does the activity produce?
4. What part of the activity is fixed

\**Dynamics of Group at Work*, University of Chicago Press, Chicago, 1954



and what can be modified to fit a particular situation?

The basic activities discussed in the fourth chapter include lectures, demonstrations, observations, interviews, brainstorming sessions, buzz sessions, group discussions and role playing.

While inservice programmes can make use of brainstorming sessions to stimulate ideas, suggest alternative solutions and enhance positive attitudes toward alternative solutions, this activity has essentially one narrow purpose. to allow ideas to surface. While only two or more people can brainstorm, this activity can be successful with groups as large as sixty or seventy provided two or three leaders are available to receive ideas and at the same time record them.

During buzz sessions temporary groups are formed to discuss a specific topic. The ideal buzz group size is five to nine members. Buzz sessions should be used only after some prior activity. Participants must be interested in the topic, have some knowledge about it, and have definite feelings to express.

The fifth chapter presents some examples of inservice programmes that have been actually implemented in a variety of settings. These are not models and are subject to modifications according to the settings in which these are to be used.

The book makes interesting and informative reading. It is a good book for teachers, teacher-educators and educational administrators.

G.C. AHUJA

### *Literature Education in Ten Countries*

An Empirical study by Alan C. Purves, John Wiley & Sons, New York, 1973, pp. 418.

TEACHING OF LITERATURE, particularly to youngsters, is by itself a major problem. Children who have access to books at home pick up the reading habit. Good, motivated teachers are also a help. Reading of literature is part of the habit of reading; what is not its part is perhaps its critical appreciation. Critical appreciation depends upon one's reasoning ability and the general ability to discriminate between good and bad literary content. It is also common knowledge that sex, age and the socio-economic factors determine reading habits and preferences. In fact, all these factors put together makes the teaching of literature difficult.

In 1965 the International Association for the Evaluation of Educational Achievement (IEA) inaugurated a cross-national survey of achievement in six subjects of which literature was one. This evaluation was carried out in Belgium, Chile, England, Finland, Iran, Italy, New Zealand, Sweden and the United States. What was not measurable was left out, e.g. culture and folklore, and literary critical terminology. On the basis of fixed criteria, stories from various countries were selected and translated. In addition to this, a ten-item questionnaire on interest in literature with items dealing with frequency of reading and re-reading, etc. was prepared and administered. Sampling was stratified and in a few cases a subsample of students within the schools was also drawn. Reliability estimates were derived for the cognitive measures and for the transfer and interest measures. Both proved highly reliable.

The focus of the study was on the influence of schools and teachers on the achievement of students, and the cross-

national data were intended to enable decision makers and researchers to see if any efficacious practice in another system could be transferred to another school setting. The home background was observed to provide a good deal of variance between schools. Also, perhaps predictably, schools with a higher proportion of girls performed better, as did more academic schools. It was also found that students whose range of reading was wider including adventure, history and biography, science fiction, travel current events, humour, etc. tended to achieve better than those whose reading was more limited. Students in higher grades were found to do better than stu-

dents in lower grades; students who did a great deal of homework performed better. So did students in classes in which textbooks were assigned. Students who were not required to recite literature from memory performed better.

Even if these findings merely reinforce known facts—that culture and background have an invidious way of influencing achievement, be it literary or scientific—and even if there are few cross-cultural transferences possible, the pioneering work done by IEA deserves special attention. In India too intra-regional comparisons on similar lines could be attempted.

□

R P. SINGH

# Select Bibliography on School Libraries

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RAJWANT SINGH  
Delhi University Library

- ALHEM, AHMED, "Centralised School Library," *Journal of RLA* 2, 1975, 83-84
- ALDRICH, F.D., *School Libraries in Ohio*, Bailey Bros, 1959.
- BANERJEA, P. K., *Problems of School Libraries in India*, Indian Libn. 17, 1962, 100-103
- BASU, B., "Development of School Libraries During Fourth Five-Year Plan with Special Reference to West Bengal," *ILA Bull.* 2, 1966, 28-34
- BOLT, J.H., *School Library Service A World View*, ILL Lib 54, 1972, 476-522
- BOSE, P.C., "School and College Libraries in the Evaluation of Education in Modern India," *ILA Bull.* 1, 1965, 12-32
- BREWER, J., "Developments and Problems in School Libraries in South Australia," *Australian Library J.* 20, 1971, 8-10
- CASE, R. N., "Experimental Models for School Library Media Education," *Lib. J.* 96, 1971, 4151-6
- CHAKRAYARTY, N.C., "Development of School Libraries During the Fourth Five-year Plan," *ILA Bull.* 2, 1966, 60-64
- , "School Libraries in India," *IASLIC Bull.* 4, 1959, 51-56
- CHISHOLM, M.E., "School Libraries in Finland," *School Library* 21, 1972, 35-37
- CHOLKAR, K.S., "Development of School Libraries in Fourth Five-year Plan with Special Reference to Maharashtra," *ILA Bull.* 2, 1966, 22-27
- COLEBOURNE, R., *School Libraries, Their Planning and Equipment*, School Library Assn., 1972
- COOPRIDER, D., *Library Cooperation School Libraries in Illinois*, Ill. Lib. 54, 1972, 334-41
- DANE, CHASE, School Library as an Instructional Materials Centre," *Peabody J. Edu.* 41, 1963, 81-85
- DARLING, R. L., *Two Decisive Decades . School Libraries & Curriculum Reform*, Amer. Library. 3, 1972, 753-757
- DENTON, P.H., "School Library Problems in Malaya," *Her. Lib. Sc.* 5, 1966, 144-148

- DRUCKER, M. P., *Primary School Library and its Services*, Unesco, Paris, 1968
- DRUCKER, D. S., "Place of Classroom Libraries in Schools," *Libra*, 1967-68, 42-43
- DRUPADIAS, V., "Directional Pattern of Organization in Academic Libraries," *IASLIC Bull* 12, 1967, 180-193
- DYER, C. *et al*, *School Libraries: Theory and Practice*, Bingley, 1970
- EARL, A. J., "Public School Libraries: A Survey" *Sch. Libn* 20, 1972, 22-25
- FINSWICK, S. I., *New Definition of School Library Service*, Univ. Chicago, 1960
- FRANKLIN, A. Y., "School Library Certification Requirements: 1974 Up-date," *Sch. Lib. J* 21, 1974, 18-19
- FRARY, M. P., "School Library Service and the Disadvantaged Student," *Lib. Trends* 20, 1971, 405-15
- GHAWAN, N. N., *Manual of School Librarianship*, Raj. Univ., 1965
- GRIMM, S. I. O., "Legislation that Rings Bells for School Librarians," *Wise Lib. Bull.* 68, 1972, 211-12
- GOH, N. K., "Development of School Libraries During the Fourth Five-year Plan: Some Recommendations," *IIA Bull.* 2, 1966, 35-59
- , "Higher Secondary School Library -- Needed a Policy For Development, etc.," *Lib. Her.* 1, 1964, 259-277
- , "School Libraries in Delhi," *IIA Bull.* 11, 1975, 25-29
- GOYAL, R. C., "Importance of Libraries in Schools," *Libra*, 1964-65, 29-32
- GREEN, F. M., "School Library: Priorities of Purpose," *New Zealand Lib.* 35, 1972, 161-4
- GUPTA, B. S., *Library Administration*, Chandigarh, 1961
- GUPTA, B. S., "Children and the Libraries," *RIA Souvenir* 1967, 37-38
- GUPTA, K. B., "School Libraries Today: Their Problems," *IASLIC Bull* 13, 1968, 174-177
- HARIZ, F. R., "Secondary School Library Movement in United States," *Her. Lib. Sc.* 7, 1968, 87-100
- HIMPSTAD, J. O., "Internship and Practical Application in Educating School Library Personnel," *J. Edu. Librship* 12, 1971, 116-132
- HUJHAIHINI, M. V., "Library System for Elementary Education: Fourth Plan Period," *Lib. Sc. Slant Docu.* 2, 1965, 385-388
- JAIN, F. C., "Achievements of Academic Libraries in India," *Lib. Her.* 6, 1963, 172-180
- JON, M. M., "School Libraries," *Indian Libn.* 15, 1961, 201-203
- KOTHAKAR, V. P., "School Library and its Librarian," *Indian Libn.* 15, 1960, 110-114
- KUMAR, B. K., "State of Academic Libraries in Developing Countries," *Her. Lib. Sc.* 8, 1969, 219-223
- LAKSHANPAI, S. K., "School Library Service in India," *Indian Libn.* 22, 1968, 199-202
- LLOYD, C. C., "School Libraries Worth Their Keep: A Philosophy plus Tricks", Scarecrow, 1972
- LOHRER, A., "School Libraries in Iran and the Near East," *IIA Bull.* 63, 1969, 1284-9
- , "School Library Materials," etc., Illinois Univ., 1963
- LOWRIE, J. F., *School Libraries: International Development*, Scarecrow, 1972
- LUKENBILL, W. B., "School Library Media Centre," *Edu. Lib. Assn. Bull.* 35, 1972, 23-28
- MAGANAND, "School Libraries", *Cultural Forum*, Libraries Special No. 9, 1967, Delhi
- & VAISH, J. D., *Higher Secondary School Libraries*, Allahabad, 1961
- MAHAR, M. H., "School Library Reporter," *Sch. Life* 16, 1963, 29
- MILFORD, H., *Library Manual for Indian Schools*, Bombay, Oxford, 1922
- MITCHELL, M. G., "What is Going on in the School Library?" *Phi. Delta Kappa* 45; 1963; 44-47

- MITTAL, R. L., *Library Administration Theory and Practice*, Delhi, Metropolitan, 1964
- MOHANRAI, W. M., "School Libraries - An educational Problem," *Her Lib Sc.* 2, 1963, 167-171
- MUKHERJEE, A. K., *School Library Some Practical Hints*, NCERT, 1965, New Delhi
- OBEROI, USHA, "Children's Libraries," *Libra* 1970-71; 23-26
- OM PARKASHI, "Academic Libraries in India - Problems of Prospects," *Her Lib Sc.* 5, 1966, 68-71
- PLATT, P., "Books on School Librarianship and Children Reading," *School Libn.* 20, 1972, 117-118
- PURTON, R. W., *Surrounded By Books The Library in the Public School*, Ward Lock Edu., 1970
- RADDON, R., "School Librarianship in England," *Ill Lib.* 54, 1972, 499-502
- RANGANATHAN, S. R., "All India Seminar on School Libraries," *Ann Lib. Sc.* 9, 1962, 100-107
- , *School and College Libraries*, Madras, MLA, 1952
- , *Organization of Libraries*, Calcutta, OUP, 1963
- ROSSOFF, M., *School Library and Educational Change*, Libs Universal, 1971
- , *Using Your High School Library*, Ed. 2
- RYAN, P., "A Library Children Love," *Indian Libn.* 11, 1956; 109-110
- SAHAYA, S., "Educator's role in the School Library Service," *Indian Libn.* 10; 1955, 53-55
- , "Introducing the Young to Never Failing Friend," *Indian Libn.* 12, 1958, 254-266
- SAUNDERS, Ole, "Book Catalogue in High School Library," *Ont Lib. Rev.* 56; 1972, 47
- SCOTT, M. B., *Periodicals for School Libraries, etc.*, ALA, 1973
- , "School Libraries in Canada," *Canadian Lib. J.* 29; 1972, 118-138
- SHAPIRO, L. T., "Bureaucracy and the School Library," *Sch. Lib J.* 19, 1973, 26-31
- SHARMA, N. K., "School Libraries in the Fourth Five-year Plan," *ILA Bull.* 2; 1966, 15-21
- SHIFRIN, M. R., *Information in the School Library, etc.* Bingley, 1973
- SILVERIO, M., "School Library Services in Czechoslovakia," *Ill Lib.* 54, 1972, 506-8
- SIMMS, T. H., "Teaching Through the Library," *Sch Libn.* 11, 1963, 365-371
- SMEATON, J., *School Libraries*, New Delhi, 1959
- SRIVASTAVA, A. P., "Some Ways For A Better Reading in School Subjects," *RLA Souvenir* 1967; 17-24
- STOTT, C. A., *School Libraries*, Cambridge Univ., 1955
- SUGRABEGUM, R., "Secondary School Library System - Fourth Plan Period," *Lib Sc. Slant Docu.* 2, 1965, 336-84
- TANDON, M. M. L., "Library Service in School and Development of Reading Habits," *Indian Libn.* 13; 1958; 6-8
- THIRUMALAI MUTHU SWAMY, A., "What Can be Done to Improve Our School Libraries?" *RLA Souvenir*, 1967, 43-48
- THOMAS, M. P., "Libraries in High Schools," *Indian Libn.* 17, 1962, 162-163
- TRASK, M., "School Library Service in Australia," *Ill Lib.* 54, 1972; 487-90
- TREHAN, G. L., *Administration and Organization of School Libraries in India*, Jullundur, Sterling, 1965
- VERMA, S. C., "School Library in Secondary Education," *Quarterly J. RLA* 2 1975, 59-65
- VISWANATHAN, C. G., *High School Library Its Organization and Administration*, Bombay, Asia, 1962
- WAKNIS, T. D., "Aims of School Libraries," *Indian Libn.* 12, 1957, 208-211
- WALLI, M. L., "Role of School Libraries in Modern Education," *Her Lib Sc.* 7; 1968; 127-131
- WOFFORD, AZILE, *Book Selection For School Libraries*, Wilson, 1962
- , *School Library at Work*, Wilson, 1959

# An Annotated Bibliography of Books on School Libraries

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S M SIBTAİN

Librarian, Delhi Public Library

ATTAN, MARGARET, *School Library Resource Centre*. London, Crosby Lockwood Staples, 1974. 165 p. £ 6.00

It is a work from the pen of a retired school librarian who has devoted a good part of her life as a librarian in the service of children. Though the book deals with the collection of books in a children's library, it also contains valuable chapters on 'Library procedure for art prints, charts and illustration', 'Films strips', 'Tapes and records', 'Games and kits', etc

BROWN, C. DYER R. and GOLDSHIN E. D., *School Libraries, Theory and practice*. London, Clive Bingley, 1970. 181 p.

It is a general book on the subject and two-thirds of the book has been devoted to child language and library methodology. The third chapter deals with the school library. The

first part of the book discusses in length the development of children's literature. It also deals with the psychological condition of a child. Only the third part of the book deals with different aspects of school librarianship which is helpful to a school librarian in planning, organizing and administering a school library.

DOUGLAS, MARY PEACOCK, *Primary School Library and its Services*. Delhi, Universal Publication, 1974. 105 p. illus. 31 photographs and diagrams. Rev. Indian Edition

The book deals with the planning of library services in primary schools. The subject has been dealt with according to the needs and necessities of a primary school library. The book is helpful as it contains photographs and diagrams of library accessories, fittings and furniture, etc. It is an Indian publication and also contains a selec-

ted reading list of the books on the subject. It also elaborates Condensed Dewey Classification.

LEGO, LUCIE, P., *Library in the School* Chicago, American Library Association, 1950.

The book is not a manual of technical processes required to run a school library, like many other books on the subject. Instead, it basically deals with principles, attitudes, administration, financing, etc. It also discusses the application of technical processes to school library situations.

GUJRATI, BALWANT SINGH, *Library in Education with Special Reference to School Library*, Jullunder, M. Njit Publishing House, 81 p

This book has been prepared keeping in view the schools in India. It contains elementary information about fittings and furniture, book selection, finance, etc. It also discusses the librarian's role in advising the students in their studies and vocational training. The book may be useful to a teacher-librarian of a small school library.

MC COLVIN, LIONEL R., *Libraries for Children* London, Phoenix House, 1951. 183 p. 8 plates.

It is a work by a well-known public librarian who has written several books on the subject. Though the author is not a children's librarian, the book has its place in the literature on children's libraries. It discusses the children's library as a part of the public library service and contains one chapter on 'School Libraries'. It also throws light on how a child should make his own library at home.

LEYLAND, ERIC ; *Libraries in Schools*. London, Oldbourne, 1961, 143 p.

The book deals with planning, book selection, classification and cataloguing, book issue and school library administration. In each chapter the author has tried to discuss the different systems prevalent at present. The main feature of the book is a chapter on the teacher-librarian, where he stresses the need to impart library service education to a teacher who can handle a school library of 2000-3000 volumes in the absence of a qualified librarian. He also emphasizes the need of library education for children.

PURTON, W ROWLAND, *Surrounded by Books ; Libraries in Primary and Middle Schools*. London, Ward Lock Educational 1962 rev. 1970. 111 p

It is a book written by one who has established and organized school libraries in three different schools in Great Britain. The author stresses the need of books other than the textbooks in school libraries. Apart from the technical side of library service the book deals with inculcating reading habits in children. Chapters on books for reference, reading for pleasure, learning to use books, individual topic work, etc. are useful. The author suggests that periodic surveys may be conducted to know the reading habits of children.

RAY, G. SHEILA, *Library Service to School* (a youth libraries group monograph) London, Library Association 1968, reprint 1969. 52, p

The small monograph discusses all the problems of the children's library. It has been prepared by a group of practising librarians, which is helpful to young library students and is a guide to the children's librarian. The booklet deals with planning book stock, cataloguing, classification, book

issue methods and acquisition and maintenance of books. It also deals with the history of school libraries.

STOLL, C. *A School Library, a Short Manual*, Cambridge University Press, 1966, 148 p.

Planning, organization and administration of a school library is the main theme of the book. A chapter on the school library and the public library throws light on the two types of libraries in relation to their services to children. It is a complete guide for a school librarian which has been planned to help him to establish a school library on modern lines.

RAIPIT, R. G. *Library in Education*, London, Phoenix House, 1962, 152 p.

The library as an integral part of school education is the theme of the book. It stresses the need to impart library service education to teachers as well as students. It also discusses at length the proper use of school library material. It is a guide on technical matters like classification, cataloguing, accessioning, etc. and selection of books and other reading material.

TRINKNER, CHARLES, L. *Better Libraries*

*Make Better Schools*, Connecticut, Stoc String Press, 1962, XXIII, 335 p.

It is a collection of short and helpful essays and articles for the use of school librarians. The articles and essays have been written by different authorities in the field. The book contains 70 essays and articles which cover almost all aspects of librarianship. Several articles deal with certain ticklish problems of library service and suggest solutions. The book does not say much about the technical side of librarianship like many other books on the subject, but gives useful information and answers to the day-to-day problems a librarian faces in discharging his duties.

VISWANATHAN, C. G. *High School Library*, Delhi, Asia Publishing House, XIV, 154 p.

The author of the book is a well-known Indian teacher of library science and the author of many good books on the different aspects of library science. The book in question deals with the organization and administration of a high school library. The chapters on 'School library system', 'Basic reference books', etc. are of special importance.





